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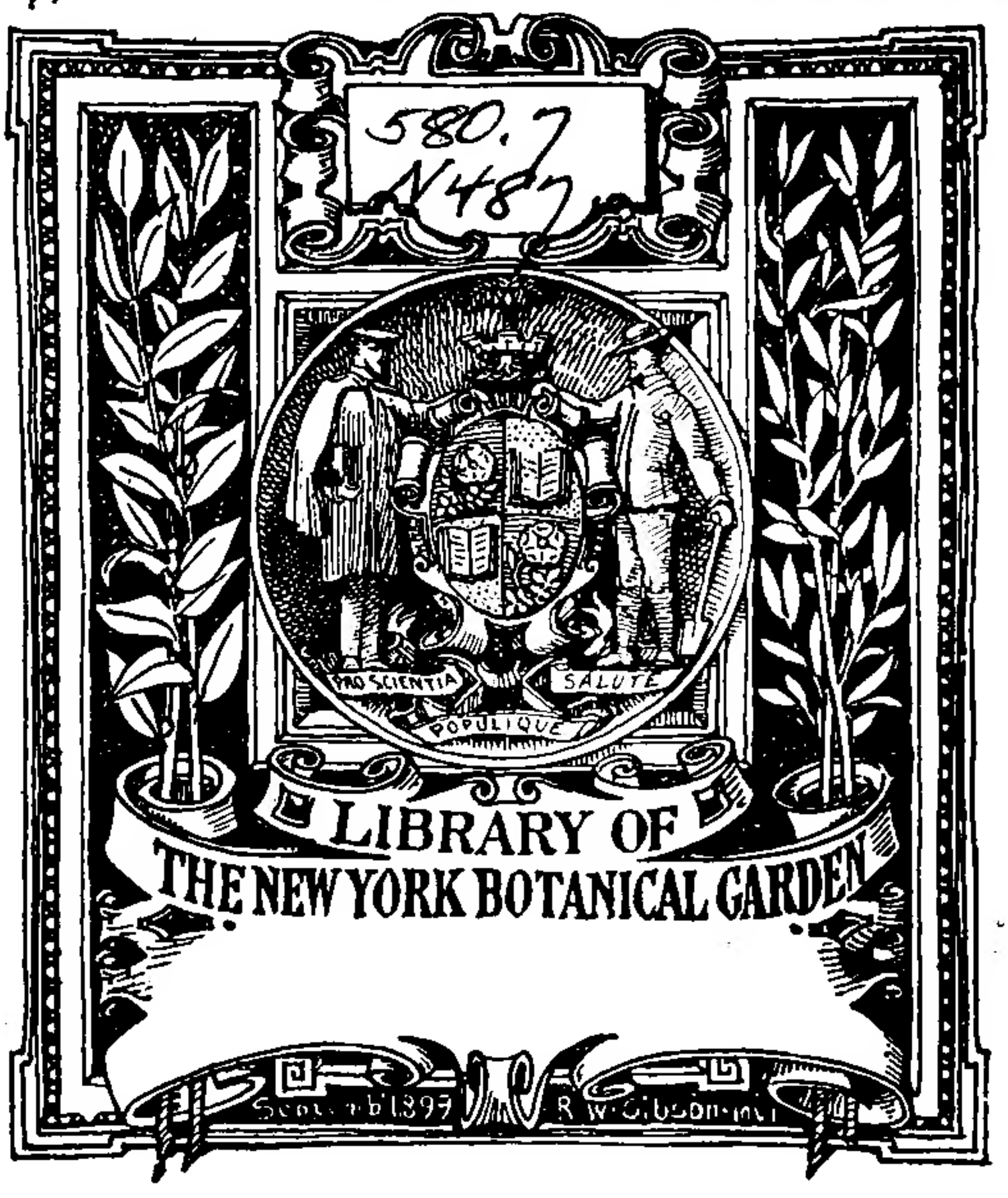
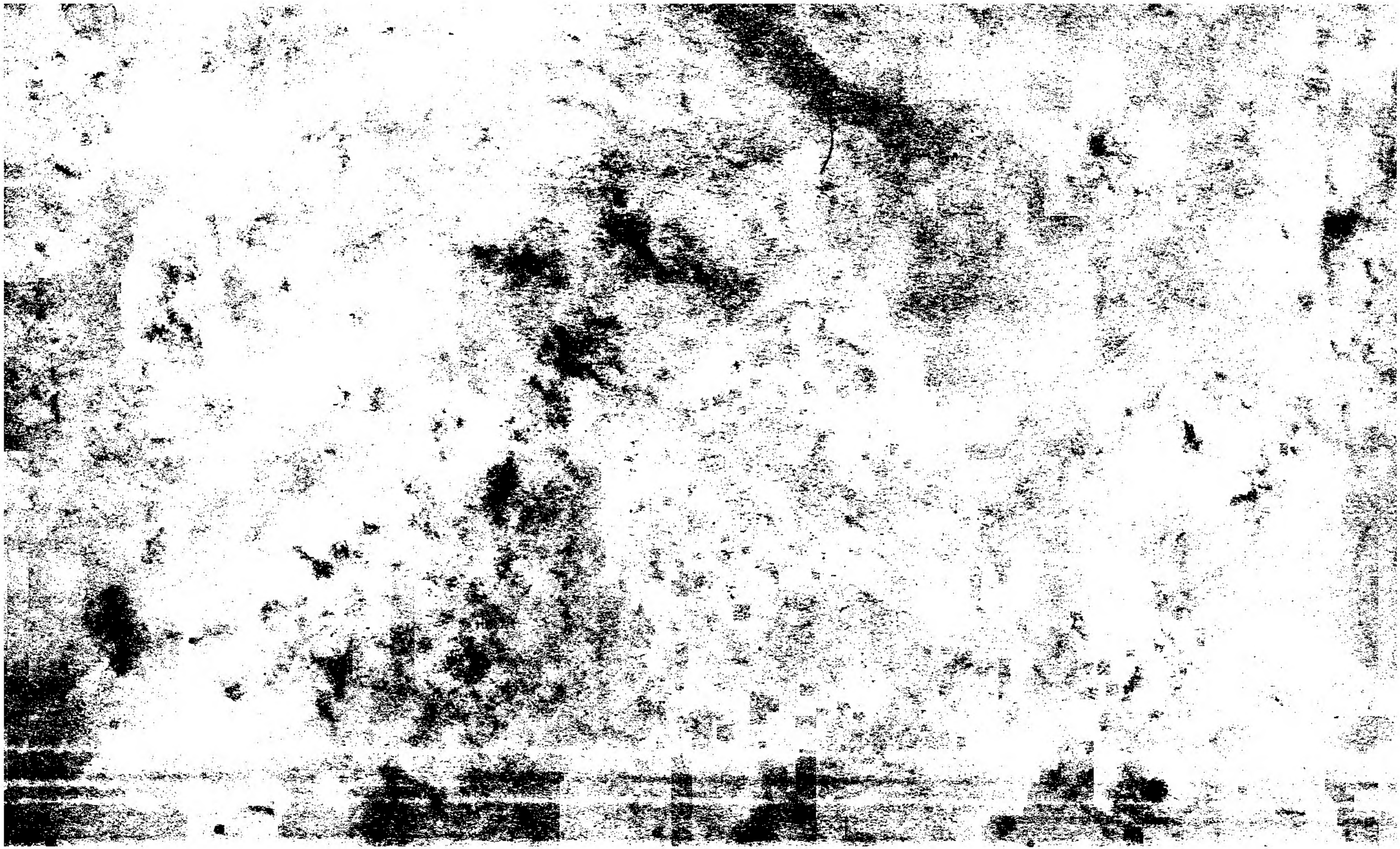
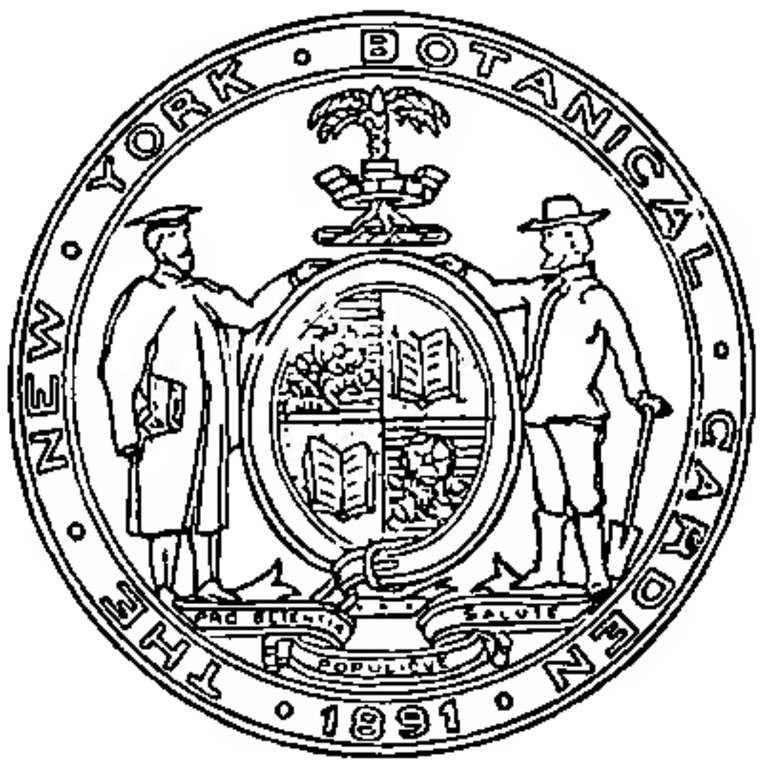




JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD
EDITOR



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1940

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CAROL H. WOODWARD, Editor

January, 1940

CALATHEA LUTEA, IN THE TROPICAL RAIN FOREST
Cover Photograph by Fleda Griffith

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THREE GREAT NEEDS

To meet the need for beauty, especially in the heart of a great city where brick walls instead of trees line most of the streets, is one of the functions of a place like The New York Botanical Garden. That is one reason why the conservatory displays, one by one, are being rearranged in garden effects or as natural forested areas; that is why the outdoor plantings of trees and shrubs, though placed more or less in taxonomic sequence for the student, are also grouped to please the eye of the passer-by.

In a booklet about the Botanical Garden issued by Dr Frederic S. Lee during the period of his presidency, three "ever-present needs" which, he said, the Botanical Garden must meet if it is to play its part adequately in the great city to which it belongs, were:

The need of beauty.

The need of education in the appreciation of growing things.

The need of scientific research into the problems of plant life.

Dr. Lee spoke of the "happy value" of close acquaintance with plants at home and knowledge of plants elsewhere, and emphasized that if plant life were swept away from the earth, man could no longer exist.

Plants are so fundamental in the life and deeds of man that to try to explain their significance means discoursing on life itself. The New York Botanical Garden exists in order that people may, partly through familiarity, partly through study and research, learn more about these plants that have so profound an effect on their lives.

The Botanical Garden invites the public to participate in its endeavors by enjoying the plant displays; attending the lectures and courses of study; evincing an interest in the scientific research and showing an appreciation of its significance; by feeling free to call upon the Garden when questions arise which members of the staff are especially equipped to answer; by using the library, which is open and free to the public; and—for those who are able—by contributing through membership, gift, or bequest to those funds which make it possible for the Garden to fulfill these three great needs of beauty, education, and scientific research.

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The Collection Of Begonias Grown At The New York Botanical Garden

By T. H. Everett

CONTINUING the article of the same title which appeared in this Journal for March 1939 (Vol. XL, p. 53), additional begonias are here described. In some cases further study has resulted in adding to the information given previously and it has been necessary to make a few corrections. Such additions or corrections will be found below under the names *acida, aconitifolia, angularis,* ***Chiala,*** *glabra,* ***Heracleicotyle, Marian, Ricinifolia,*** and *Scharffii.*

Because of the great confusion which exists in begonia nomenclature I have been reluctant to create new names, but where plants are being grown under names which by right of priority belong to other begonias this remains the only logical course. In other instances new names are given to plants which I have every reason to believe are of garden origin but which previously have had no accepted name. New names proposed are preceded by an asterisk. As in the previous article all descriptions have been prepared from living material and specimens are or will be deposited in the Cultivated Herbarium at the Garden. As opportunity affords duplicate specimens will be sent to the Bailey Hortorium, Ithaca, New York, and to Kew, England. Mrs. Hildegard Schneider has aided in carrying out the research work and in preparing the descriptions.

As before, the dates in parentheses indicate the year of introduction into cultivation. Names of plants accepted as true species appear in lightface italics; names of plants of horticultural or uncertain origin are in boldface.

Begonia Descriptions

acida—(Brazil). This is the plant known as "***braziliensis***" (Journ. N. Y. B. G. March 1939, p. 56 and Nov. 1939, p. 256).

aconitifolia -(Brazil), described by A. DeCandolle (Ann. Sci. Nat. Ser. IV. XI. (1859) 127). This is the correct name of *B. Faurcana* of Garnier (L'Illustr. Hortic. **XLII**, 152. 1895). The plant described as *B. Faureana metallica* by Buxton (Begonias and How to Grow Them, p. 59. 1939) is synonymous. A description appeared in the Journal of the N. Y. B. G. for March 1939 under the name *B. Faureana.*

aconitifolia* var. ***Hildegard Schneider*. This new name is given to a distinct variety of *B. aconitifolia* often misnamed *B. Faurcana* and so described by Buxton (Begonias and How to Grow Them, p. 58, 1939). Its origin is unknown. It may be one of the several *B. Faurcana* variations mentioned by Garnier or it may be a later seedling. It differs from the type of *B. Faureana* in that the lobing of the leaves is deeper, the segments narrower, and one lobe is much longer than the others; also in that the silver markings occur as distinct streaks and spots rather than as broad areas which appear as if smeared on with a paint brush.

Hildegard Schneider is of medium height and smooth; stems and branches erect from a much thickened base, at first green, becoming brown with age; leaves asymmetric, ovate, to 10 inches long by two-thirds as broad, deeply four-lobed, the sinuses extending two-thirds the distance from the margins to the base, one lobe distinctly longer than the others, the major lobes again divided, margins finely serrate, veins depressed and on the underside reddish, upper surface green marked with silver spots and streaks, under surface paler, tinged pink; inflorescences slightly pendulous, peduncles short; staminate flowers about 1½ inches across with two broad ovate, pink-tinged petals and sometimes one smaller petal, stamens numerous, yellow: pistillate flowers five-petaled, petals cupped, of unequal size, tinged pink on the outside, style cream-colored with three crescent-shaped stigmas, ovary about ½ inch long with one wing larger and more pointed than the other two, wings to ⅜ inch broad. Winter blooming.

albo-picta — (Brazil) low, compact, glabrous; leaves small, elliptic-lanceolate, short-petiolate, glossy-green, silver-spotted; inflorescences few-flowered, flowers greenish white.

Alzasco—(***Lucerna*** seedling) medium, glabrous; stems stiff, erect, sparsely branched; leaves oblong-lanceolate, black-green, silver- or pink-spotted when young, maroon-purple beneath, margins undulate; flowers brownish red. Originated in California (1934).

angularis—To the description appearing in the Journal of the N. Y. B. G. for March 1939, p. 55, add: Male flowers nearly one inch across, white, margined pink.

Bennett Rubra (*B. coccinea* seedling) medium, smooth; stems erect, branches slender, drooping; leaves ovate-lanceolate, concave above, green, faintly silver-spotted, margins thick, red, undulate; inflorescences drooping, flowers soft salmon-pink. Originated in California (1932).

****Bessie Buxton***—The name ***Flambeau*** under which this begonia is sometimes grown belongs to a ***hiemalis*** variety. Although quite distinct from ***Feastii***, ***Bessie Buxton*** is often referred to as the upright ***Feastii.***

Bessie Buxton is of medium stature, pilose particularly on the younger parts; stems stout, erect, with many short erect branches; petioles to 4 inches long, terete, drooping on mature leaves, leaf-blades broad-ovate, to 7 inches long by 5 inches wide, on the short flowering branches very much smaller, cordate at base, basal lobes overlapping, margins finely toothed, ciliate, upper surface olive-green, lower surface reddish; inflorescences many, peduncles erect (at least when flowers are in bud), branches very short, staminate flowers dipetalous, 1 inch in diameter, petals orbicular-cordate, soft pink. Female flowers not observed.

****cheimantha***—In proposing this group-name for the *B. socotrana—B. Dregei* hybrids, of which ***Gloire-de-Lorraine*** raised by Victor Lemoine in 1892 was the first, I have in mind the need for a designation which will serve for this group in the same manner as ***tuberhybrida*** and ***hiemalis*** answer for the particular classes to which they are applied. ***Cheimantha*** varieties include seedlings, bud-sports and hybrids of ***Gloire-de-Lorraine*** or its derivatives, and are commonly known as Christmas Begonias. The varieties now in cultivation at the Garden include ***Gloire-de-Lorraine, Glory of Cincinnati, Lady Mac***, and ***Melior.***

Chiala—To the description appearing in the Journal of the N. Y. B. G. for

March 1939, p. 56, add: One inflorescence has appeared on our plant but the flowers did not expand; staminate flowers dipetalous, hairy without, greenish-white.

Chiala Rosea—medium, bushy; stems much-branched, with scattered bristly hairs; leaves lanceolate, slightly lobed and toothed, above smooth, deep olive-green, beneath red, veins hairy. Differs from *Chiala* in being much lower and bushier, in having a red spot at the base of leaf blade and in having leaves quite smooth above. From *Wallow* it differs in having smaller and narrower leaves which are less intensely blood-red beneath. Has not bloomed at Garden. Originated in California.

The begonia above is undetermined botanically. It is grown as 'ecuadoriensis."

Corinthian Pink—(a *B. coccinea* variety). Flowers delicate-pink, with pink-winged red ovary. Originated in California.

Davisii—(Peru) low, tuberous; stems erect, branched, hairy; leaves broad-ovate, crenate, dark-green, beneath red, petioles pink, hairy; inflorescences barely exceeding foliage, flowers orange-scarlet within, yellowish-pink without. Summer blooming. (1876)

Dawn (***Abel Carrière*** seedling) low; stems wiry, nearly erect; leaves ovate-lanceolate, above bristly-hairy, silvery with green veins, beneath sparsely hairy, green suffused with red, petioles white-villous. A slow grower. Has not flowered at Garden. Originated in California (about 1928).

****Decker's Select***—This is the plant commonly grown as *robusta* Decker's and Decker's *robusta*. It is not related to the true *B. robusta* of Blume. Similar to ***Ingramii*** but with darker foliage and flowers.

Decker's Select is tall, bushy, smooth; stems many, arising from a thickened base, erect, succulent, much-branched, nodes swollen; petioles to 1¼ inches long, flattened and grooved above, leaf-blades obliquely ovate, to 3½ inches long by 2 inches wide, usually smaller, dark green above, paler beneath, tinged reddish, both surfaces glossy, margins red, irregularly serrate, finely ciliate; inflorescences many, peduncles 3 inches long, deep red, inflorescence branches short, divaricate; staminate flowers 1 inch in diameter with two ovate carmine-pink and two narrower obovate paler petals, stamens bright yellow in a loose circular bunch; pistillate flowers 1¼ inches in diameter, petals five, narrow, carmine, ovary white with carmine wings, stigma greenish-yellow.

"***ecuadoriensis***"—an unidentified species said to have been raised in California from seed collected in Ecuador. The *B. ecuadoriensis* of Buxton (Begonias and How to Grow Them, p. 29, 1932) is a synonym of *B. acida* and hence is invalid. (See this Journal for Nov. 1939, p. 256.) The present plant is of medium size, deciduous; stem very stout, erect, rarely branching; leaves large, orbicular or reniform, deeply palmately lobed, olive-green, white-pubescent, veins depressed, red at base, under surface reddish, bristly-hairy; inflorescences erect, flowers white or pale pink.

Elithe—(*B. coccinea* seedling) medium, smooth; stems slender, erect; leaves ovate-lanceolate, dark green, lightly silver-spotted, beneath wine-red except at margins; flowers pink. Originated in California (1934).

Evansiana alba—identical with *Evansiana* except that the flowers are almost pure white.

Fisher's Ricinifolia (***Ricinifolia*** seedling?) very similar to ***Marian***, differing in that the leaves are less hairy above and are bright green rather than bronzy-green, in that under surface is green or very slightly flushed red rather than distinctly red, and in that the inflorescences are more crowded and the flowers paler pink.

Froebelii — (Ecuador) low, tuberous, pilose; stems erect; leaves obliquely cordate, bright green; inflorescences exceeding foliage; flowers brilliant scarlet-crimson, outer segments pilose without, anthers red, margined gold. Attractive. (1872) (See this Journal for December 1939, pp. 276-7.)

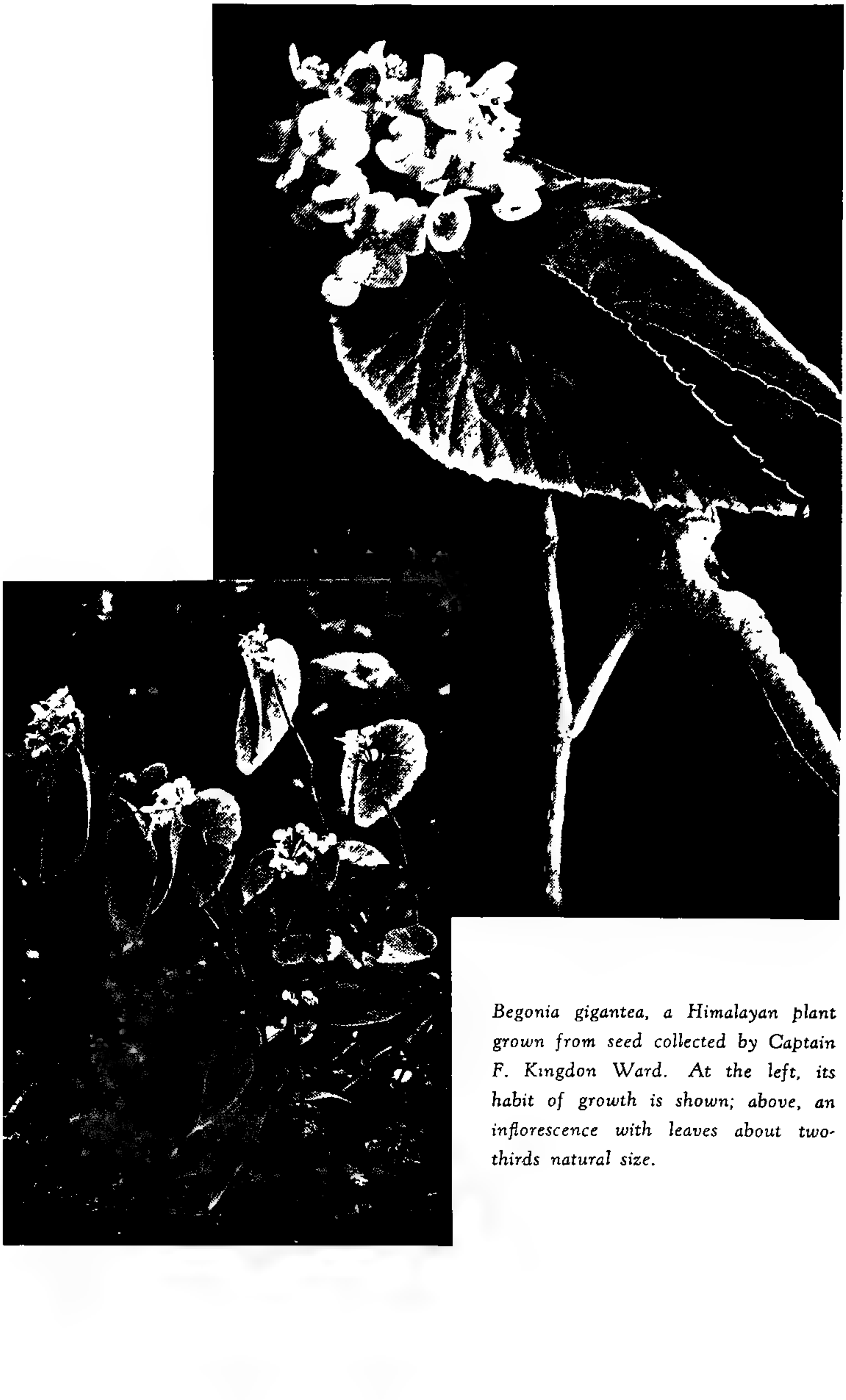
Geneva—(***Lucerna*** seedling) tall, vigorous, smooth; stems cane-like, freely branching; leaves ovate, dark green with distinct silver spots, beneath purplish red becoming paler toward margins; inflorescences short; flowers deep pink, partly hidden by foliage. Originated in California.

gigantea (Himalayas) medium, sparsely pubescent; stems many from a thickened base, light green, markedly swollen at nodes, few-branched, leaves ovate-acuminate, shallow cordate, light green; inflorescences short, apparently terminal and also axillary in the upper leaves; flowers pale pink, males four-petaled, ¾ of an inch in diameter. Our plant grown from seed collected by Captain F. Kingdon Ward in 1936. (1820)

glabra—This is the correct name of the plant described as *B. scandens* in the Journal of the N. Y. B. G., March 1939, p. 63, and illustrated on p. 61.

Grace—a soft-pink-flowered variety of *B. coccinea*.

****Grey Feather***—This is presumably a seedling of "***Compta***" and has been referred to as the angular ***Compta***. It differs from "***Compta***" in that the leaves are narrower, the margins more undulated, shallowly lobed, and in that the whitish-grey bands



Begonia gigantea, a Himalayan plant grown from seed collected by Captain F. Kingdon Ward. At the left, its habit of growth is shown; above, an inflorescence with leaves about two-thirds natural size.

At the extreme left is "Compta" and at its right is Grey Feather, which is believed to be a seedling of the former. It is being described for the first time here. The narrower leaves of Grey Feather, with more undulated, shallowly lobed margins, can be distinguished in the picture.

At the extreme right is the newly named variety Hildegard Schneider, and beside it is B. aconitifolia of which it is a variety. Both forms have been grown as B. Faureana.

bordering the veins are broader and less sharply defined.

Grey Feather is of medium height and glabrous; stems erect with spreading branches; leaves very asymmetrical, lanceolate, to 6½ inches long by 2¼ inches wide, the margins undulate, shallowly but distinctly lobed and crenately toothed; upper surface greyish-green with silver-grey areas along veins; inflorescences with 6-inch-long peduncles, the flowers pure white, many together in rather tight clusters.

Guinea's Wing medium, smooth; stems cane-like, branching; leaves lanceolate, concave, dark green, heavily silver-spotted, beneath faintly pink-tinged; inflorescences drooping; flowers deep pink, decorative and very floriferous.

Heracleicotyle — (*B. heracleifolia* x *B. hydrocotylifolia*) is the correct name of ***Mrs. Townsend.*** (Journ. N. Y. B. G. March 1939, p. 60.) (1895)

hiemalis—Here belong varieties which have resulted from crossing *B. socotrana* with Andean tuberous species or their hybrids. The first ***hiemalis*** variety was introduced by Veitch in 1883. Varieties grown at the Garden include ***Emily Clibran, Flambeau, Optima*** and ***The Pearl.***

"Houghtoni"—bears a strong resemblance to *B. Scharffii* but is lower and bushier, the leaves are smaller with basal sinus less marked, paler and often more strongly lobed, and the apex long-acuminate rather than short-acute or rounded. This plant is often misidentified as *B. urophylla,* from which it differs in producing stems, in being softly hairy throughout, and in that the staminate flowers have four and the pistillate flowers five petals rather than each being dipetalous.

Hugelli — (Brazil) medium, densely white-pilose; stems erect; leaves large, broad-ovate, shallowly lobed and toothed, acute, green, beneath reddish with red veins; inflorescences large, loose; flowers white, the four petals of the staminate strongly reflexed and white-bearded without, pistillate flowers smaller than the staminate, five-petaled, ovary short. Received from Kew, 1938. (1855)

Illustrata — low, rhizomatous, hairy; leaves crowded, ovate, rugose, not lobed, margins toothed, ciliate, leaden green, veins green; inflorescences erect, slightly exceeding foliage; flowers dipetalous, drooping, greenish, usually suffused with deep pink, hairy without, bracts caducous.

isoptera var. *hirsuta*—(E. Indies) distinguished from the type by its less robust habit, smaller leaves and hairy petioles.

Lady Waterlow — low, sparsely hairy, freely branching; stems slender; leaves ovate-pointed, very asymmetric, the blade to 3¼ inches long by 1½ inches wide, margins undulate, serrate, ciliate; upper surface glossy, beneath silvery or greyish green with pink veins, petioles bright red, to 1¼ inches long; inflorescences axillary, branches red; staminate flowers four-petaled, the two outer petals blush-pink and much broader than the two inner which are white, to 1½ inches in diameter; pistillate flowers 1⅜ inches in diameter, five petaled, pale pink, ovary white with one pink wing much broader than the other two. A good winter-blooming variety received under this name from Kew in 1934. I have not found the name in literature.

Lettonica—(*B. heracleifolia* x *B. nelumbiifolia*) medium, rhizomatous, pubescent; leaves large, ovate-acuminate, cordate, shallowly lobed, green, beneath reddish and brown-pubescent, margins red, toothed, ciliate, petioles to 2 feet long; inflorescences tall, pyramidal, flowers clear pink. Originated in Botanic Garden at Riga, Latvia, about 1935 and simultaneously at Liège, Belgium. Received from Kew 1938.

Lichmanni—(Mexico) low, rhizomatous, pilose; leaves erect, orbicular in outline, sharply lobed, green blotched with silver, beneath tinged purplish; inflorescences scarcely equaling the foliage; staminate flowers 1½ inches in diameter with two outer greenish petals and two inner white petals; pistillate flowers 1 inch across with two large and one small petal; style two-branched; ovary leaf-green with three fleshy wings. Our plant collected in Mexico in 1938. (See this Journal for December 1939, p. 279.)

Loma Alta— (*B. Scharffiana* seedling) tall, vigorous, hairy; stems stout, erect, deep red, leaves ovate, 10 inches long by 6 inches wide, basal lobes overlapping, dark green, beneath deep wine-purple, margins finely toothed and ciliate. An excellent foliage variety. Has not bloomed at Garden. Originated in California about 1936.

Begonia Manni belongs to the same group of begonias as B. Poggei, shown on the cover of this Journal for last March. Like its relative, it is a native of tropical Africa, coming from Fernando Po.

Macbethii Pink—A pink-flowered seedling which except in color of flower resembles *B. Dregei* var. ***Macbethii.*** Originated as a chance seedling in California.

Manni—(Fernando Po) low; stems erect, branching; leaves ovate-acute, pinnately veined, irregularly dentate, green, beneath paler and tinged red, veins brown-tomentose; inflorescences very short, staminate and pistillate flowers on separate inflorescences, flowers watermelon-pink, the pistillate distinctive because of their four or five erect, bright yellow and crimson style-branches, ovary cylindrical, green, wingless, finely brown-tomentose. Received from Botanic Garden, Hamburg, Germany, 1939. (1862)

Marian -(***Ricinifolia*** seedling?) this is one of several begonias commonly misnamed ***Ricinifolia.*** As such it was described in this Journal for March 1939, p. 63. It differs from the true ***Ricinifolia*** in that the leaves are of stiffer texture, are somewhat less deeply lobed, are smaller (to a foot long), and in that each forking point of the inflorescence gives rise to one long and one short branch so that a pyramidal inflorescence results.

****New Hampshire*** — (*B. semperflorens* hybrid?) A distinct variety often named *B.* ***lepidota,*** **but as this is a synonym of** *B. manicata* it cannot be applied here.

New Hampshire is a plant of medium height and vigorous habit resembling a very strong *B. semperflorens.* Stems smooth, semi-succulent; leaves smooth, obliquely orbicular-ovate, to 4½ inches across, green with conspicuous, irregular yellowish blotches and a red spot at the basal sinus, margins toothed and ciliate; inflorescences more or less erect, flowers pale pink, the staminate with two large reniform and two narrow obovate petals, the pistillate with five petals of unequal size. A free bloomer, not very attractive. Originated in New Hampshire.

nitida* var. ***Rosea*—a very fine form of *B. nitida.*

Var. ***Rosea*** is smooth, to 3 or more feet high; stems erect, few-branched, the branches weaker than the main stems; leaves thick, asymmetric, heart-shaped, convex above, to 7 inches long by 4½ inches wide, petioles to 3 inches long,

drooping on mature leaves; inflorescences showy, the cymes measuring 8 inches through, on peduncles to 8 inches long; staminate flowers numerous, 1½ to 1¾ inches in diameter, petals four, two of them large and broadly ovate, two smaller and elliptic, clear pink deepening at the margins, stamens golden, forming a conspicuous central bunch; pistillate flowers less numerous, smaller, with five unequal petals, also clear pink, deepening at the margins; ovary and wings green flushed pink, wings three of varying sizes, all erose. Received from a trade source as "odorata rosea"

"***odorata alba***"—The correct name of the plant commonly grown in the United States under this name is undetermined. In literature "***odorata alba***" of gardens is commonly referred either to *B. nitida* of Aiton or to the nearly allied *B. suaveolens* of Haworth. The plant grown seems to be quite distinct from either and is probably a separate species. It differs from *B. nitida* in being lower and much more freely branched, in having stems and petioles sparsely furnished with conspicuous hairs, in having glossier, flatter leaves, and in having pistillate flowers which are larger than the staminate flowers and form the attractive portion of the inflorescence (the staminate flowers usually drop without expanding). An important difference is that the pistillate flowers of "***odorata alba***" have two conspicuous, persistent bracts at the base of the ovary. Flowers white or tinged pink.

Pearcei -(Bolivia) low, tuberous, finely pubescent; stems branched; leaves long-petiolate, broad-ovate-attenuate, irregularly toothed, dark green with silver-green veins, beneath whitish or flushed pink; inflorescences exceeding foliage, each of one male and two female flowers, flowers yellow or greenish-yellow. (1866)

picta — (Nepal) small, tuberous, pubescent; stems succulent, unbranched; leaves heart-shaped, scarcely oblique, light green with brown bands along veins, glossy and furnished with both red and white hairs, beneath pale green with red markings; inflorescences exceeding foliage, two- to four flowered; flowers clear pink. (1804)

Popenoei—(Honduras) medium, rhizomatous, hispid and tomentose; leaves ovate, cordate at base, not lobed, bright-green, margins reddish, irregularly toothed and ciliate. Has not bloomed at Garden. Received from Botanic Garden, Hamburg, Germany, 1939. (1930)

Prunifolia Pink — medium, bushy, white-hairy; leaves broad-ovate, olive-green, beneath light red; inflorescences as in ***Prunifolia***, but flowers soft pink. Quite distinct from ***Prunifolia***, the leaves much larger (to 8 by 4½ inches), duller and less concave. Originated in California.

Ricinifolia—(*B. heracleifolia* x *B. peponifolia*) medium, rhizomatous, hairy; leaves large, rotund, lobed to one-third their diameter, bronzy green; inflorescences tall, the forking branches of nearly equal length so that a rounded rather than a pyramidal inflorescence results; flowers numerous, pink. A description of ***Marian*** was published in the Journal of the N. Y. B. G. for March 1939, p. 63, as ***Rinicifolia.*** The true ***Rinicifolia*** which is probably the oldest hybrid, has much larger and softer leaves than ***Marian.*** Originated in England. (1847)

robusta—(Java) medium, white-pubescent; stems stout, fleshy; leaves green, broad-ovate, to 1 foot long by 8 inches wide, shallowly lobed, toothed, ciliate, cordate, petioles to 1 foot long; inflorescences not exceeding foliage, flowers creamy-pink. Raised from seed received from Java. ***Ingramii*** is commonly misnamed *B. robusta.*

Roxburghii — (Himalayas) medium, sparsely hairy; stems many from a much thickened base, slender, erect, branched; leaves large, broad-ovate, not lobed, upper surface glossy green, convex, lower surface paler, margins toothed and ciliate, base shallowly cordate; inflorescences very short, few-flowered, flowers fragrant, white, ovary green with four fleshy wings. (1864)

rubro-venia (Himalayas) low, rhizomatous; stems erect, branching; leaves obliquely pointed-ovate, glossy green, beneath green or red with brown tomentum on veins, margins shallowly scalloped, petioles brown-tomentose; inflorescences short, few-flowered; staminate flowers with two greenish white inner petals and two outer petals which are tinged pink; pistillate flowers greenish white or tinged pink, five-petaled, ovary pale green. Our plants lack the strong red veining on the outer petals depicted in Bot. Mag. *tab. 4689*. Received as *B. megaptera*. (1853)

Scharffiana — (Brazil) low, compact, densely soft-pubescent; stems red,

branched; leaves ovate with basal lobes overlapping, dark green, beneath red. Has not bloomed at Garden. Flowers said to be white with red hairs. (1888)

Scharffii—This is the correct name of *B. Haageana*. Contrary to the opinion of Watson in his original description of *B. Haageana* (Gard. Chron. **LXVI.** 388. 1889), the prior publication by Regel of *B. Scharffiana* for a different plant does not invalidate Hooker's *B. Scharffii*.

Scharffii var. ***Drostii*** — a distinct variety received from Kew in 1935 as *B. Haageana* var. ***Drostii***. I have been unable to trace the varietal name in literature. Medium height, bushy habit, whole plant densely white-pubescent; stems numerous, stout, succulent, much branched; leaves ovate, concave above, to 9 inches long and 5½ inches wide, margins nearly entire, basal sinus deeply cut, lobes overlapping, upper surface black-green, beneath brownish red, petioles long, red; inflorescences drooping, many-flowered; staminate flowers with two nearly orbicular and two narrow spatulate petals, 2½ to 3 inches in diameter, pale pink with red beard on outside; pistillate flowers to 1¾ inches across, five-petaled, pale pink, ovary pink with red hairs.

socotrana—(Socotra) Low, bulbous; stems green, succulent; leaves peltate, orbicular, strongly depressed at center, above glossy green, glabrous, beneath paler, hairy especially along veins, margins crinkled, toothed, ciliate; inflorescences erect, exceeding foliage, flowers clear pink. Parent of the ***hiemalis*** and ***cheimantha*** begonias. (1880)

Suncana—(*B. incana* x ***Sunderbruckii***) low, rhizomatous, pubescent; leaves peltate, orbicular-ovate, shallowly lobed, dull green above, paler beneath, both surfaces scurfy with a tomentum which at first is white but turns brown on mature leaves. Flowers said to be white. Has not bloomed at Garden. Originated at Rockville, Maryland. (Recent origin)

Veitch's Carmine* — (*B. Dregei* x *B. coccinea*). This variety was originated by Veitch of England in 1895 and introduced as ***B. carminata,*** but as this name had been previously applied to a begonia (Floral Mag. *tab. 551.* 1871) it is invalid for the Veitch plant.

Veitch's Carmine is of medium height, bushy, glabrous; leaves short-petiolate, ovate-acuminate with shallow acute lobes, toothed, green with red spot at base and narrow red margins, beneath paler; inflorescences many, drooping, flowers bright carmine, the pistillate the showiest. Very decorative and long blooming.

****Velvet Queen***—(*B. decora* x *B. Bowringiana*). A hybrid produced by Lemoine in 1914 and introduced as "***venusta***" (Revue Horticole **86**: 134. 1914.). As an Asiatic species was described as *B. venusta* in 1902 by King (Journal Asiatic Society Bengal; LXXI. Part II, No. 1, p. 65) it is necessary to give the hybrid plant a new name.

Velvet Queen resembles in general appearance *B. Cathayana,* but it is bushier, more densely pubescent and the leaves are of softer texture; stems semi-succulent, erect, red becoming brown below; leaves ovate, to 6 inches long by 4 inches wide, upper surface olive-green with a slightly paler zone paralleling the margin, densely covered with pink hairs, main veins pale green, under surface deep red, pink-pubescent, margins finely dentate and ciliate, petioles nearly as long as leaf-blades, terete, succulent and densely pink-hairy; inflorescences with long drooping slender peduncles which bear five to nine yellowish pink flowers; staminate flowers four-petaled, the two outer petals ovate, to ⅞ inch long by ⅝ inch wide and hairy without, the two inner petals elliptic and crinkled, ⅜ inch long by ¼ inch wide, stamens yellowish in a cylindrical column; pistillate flowers ¾ inch in diameter with five or six petals of unequal size, stigma yellow, branches much twisted, ovary ¼ inch long, pink-hairy, with three sharp-pointed wings. Received from Kew 1937.

Wallichiana · (East Indies) small, bushy, glandular-hairy; stems branched, succulent; leaves small, broad-ovate, glossy, light green, with conspicuous white bristly hairs, beneath paler; flowers small, white or greenish, tinged pink, finely pilose without. Of small decorative value. (1851)

Zelma—(*B. coccinea* seedling?) medium, smooth, stems cane-like; leaves ovate-lanceolate, green sometimes silver-spotted, beneath reddish; flowers dingy white, pinkish or greenish. Unattractive. Originated in California.

Zurich—(***Lucerna*** seedling) medium, smooth; stems erect, branching; leaves ovate-acute, concave above, dark green, sometimes sparsely silver spotted, margins crinkled, irregularly dentate; inflorescences short, drooping, showy, flowers pink. Originated in California.

In addition to the species, varieties and forms described above, and in this Journal for March 1939, begonias bearing the names listed below are cultivated at the Garden. Descriptions are not given either because of uncertainty of the correct applications of the names they bear or because they have not yet been sufficiently studied here. Many distinctive plants as yet unnamed are also grown. The ***tuberhybrida*** varieties are not listed. Names which appeared in the March 1939 listing and are not accounted for in this present discussion have been discarded as definitely not belonging to the plants to which they were applied.

ALBA PERFECTA
ALBA SCANDENS
ALICE MANNING
ANNIE LAURIE
AUDREE
BERTINII HYBRIDA COMPACTA ZEUSCH'S
BAUMANNII
BERTHA MCGREGOR
BOLIVIENSIS SUPERBA
BRONZE QUEEN
CAPT. MEMO
CLEMENTA
CORIACEA FLORA ALBA
CRENULATA
CUCULATA
CYPRAEA SEEDLING
DARK STAR
DOLFUSS
DUKE OF CAMBRIDGE
FLORIBUNDA
FRUTICOSA
FRUTICOSA SEEDLING
FRUTISCARIA
GEMMIPARA
GRACILIS
GRACILIS KATHE TEICHER
GUATEMALA
IMMENSE
JOSEPHII
LOBATA VARIEGATA
MARIETTA
MARTIANA
MARTIANA GRANDIFLORA
MAYBELLE E.
MIKADO
MORGANA
MRS. HARNEY
MULTIFLORA "COPPERY GOLD"
MULTIFLORA "FIRE FLAME"
MULTIFLORA "GOETHE"
MULTIFLORA LAFAYETTE
NATALENSIS
OTTO HACKER
PALOMAR
PEACH GLOW
PEARLI
PERFECTIFLORA
PERLE DE GARD
PUNCTATA
RED COMPTA
REICHENHEIMI
RICHARD ROBINSON
RIGIDA
ROBEGO
ROBINSON'S FRUTICOSA
RUBRA PINK
SATRAPIS
SIKKIMENSIS
VAN-EX
VEDDERI
WHITE CANE

BEGONIAS

A well illustrated booklet of about 40 pages, containing articles on begonias which have appeared in this Journal since last March, is to be published soon. The price will probably be 25 cents. If you would like to receive an announcement when it is ready, send your name and address at once to The New York Botanical Garden, Bronx Park, Fordham Branch P. O., New York City.

Frederic S. Lee

By Carol H. Woodward

IN the death on Dec. 14 of Frederic S. Lee at the age of 80, the New York Botanical Garden lost one of the greatest single benefactors of its entire history. From 1923 through 1927 Dr. Lee was President of the Botanical Garden, and during that period, through his personal efforts, he added more than a million dollars to the Garden's endowment. His aim had been to raise $4,160,000 out of the $7,000,000 that he felt was needed for the maintenance of the Botanical Garden and its expansion; but his work was cut short by the necessity of devoting more time to his career as Research Professor of Physiology in the College of Physicians and Surgeons at Columbia University. He retired from all active connection with the affairs of the institution in 1927 after nearly 25 years of association, first as a member of the Board of Scientific Directors, then as Vice-president (1921-23), and finally as President.

Much of the exterior construction going on today was urged nearly 15 years ago by Dr. Lee, and much of the scientific activity that now is taken for granted as a regular part of the institution's work was first introduced by Dr. Lee, the scope of whose scientific interests was always broad. He was the first to have plant pathology made a separate branch of the Garden's activities, foreseeing the need for investigation of such diseases as black-spot of roses and dahlia mosaic, and he was a staunch supporter of laboratory work, breeding experiments, and other branches of botanical study which might make the work of the Garden more useful both to scientists and the public. He advocated making studies of soil micro-organisms and chemistry, and of air pollution brought about by automobiles in the city. He also recommended more extensive research on trees, on economic plants, and horticultural material, and sought greater co-operation between the staff of the Garden and the department of botany at Columbia University in the solution of timely botanical problems. His particular interest in matters dealing with plants was in their scientific, economic, and esthetic relation to man. His aim, as stated in the New York Sun about the middle of his garden career, was to "provide a new approach to the science of plants and flowers in relation to beauty."

Dr. Lee's first message to the Board of Managers, after his election in January 1923, was to ask that a larger endowment be raised in order to increase the staff, extend the scientific research, and enlarge the sphere of the Garden's work.

Reiterating his demand nearly two years later, he declared: "New York's Botanical Garden in Bronx Park is to be made the greatest of its kind

in the world through the expenditure of $7,000,000 to be obtained from personal beneficence." The following year he was appointed chairman of the fund.

At that time he said: "Further expansion of The New York Botanical Garden can not be undertaken without consideration of traffic conditions." The increasing use of the automobile in the twenties made him realize the need for keeping general traffic away from the Garden, and he was the first to outline the plan that is now going into effect: that of fencing the Garden and rerouting traffic around its borders. Speaking of the ending of the then new Bronx River Parkway at the Garden, Dr. Lee once said:

"The Botanical Garden presents the largest, most varied, and most beautiful single feature of this route. The number of its visitors who come by motor car will, therefore, be much increased, and this will contribute in considerable degree to the Garden's popularity.

"But the continuous increase in through-traffic through the Garden has its disadvantages. The functions and ideals of a botanical garden are different from the functions and ideals of a public park.

"In view of the new plans adopted for the development of the Garden, a thorough study of the problem now presented by the automobile is recommended."

This statement was issued in January 1926, at the time when the Board of Managers voted to raise $4,160,000 of the $7,000,000 for which a need was felt.

Today, a fence to surround the Garden is nearing completion, and when it is finished, parkway and city traffic will be rerouted outside of the Garden's grounds, thus fulfilling Dr. Lee's hope that the institution might be used as a botanical garden, not alone as a public park.

Two of the principal donors to the new fund, toward which Dr. Lee did the bulk of the work, were John D. Rockefeller, Jr., who contributed $500,000 and Edward S. Harkness, $300,000. Announcement of these gifts, with others totaling $1,019,000 for the endowment, was made by Dr. Lee in February 1927. "The campaign has been going on quietly for months," he said, adding that it would continue until the desired sum was raised. He described these opening gifts as the "first chapter" in an effort to increase the Garden's funds.

But later that same year, Dr. Lee felt the pressure of his work at Columbia and his many other outside interests, and he tendered his resignation, to become effective Nov. 17. He had been the active force in the raising of more than a million dollars for the endowment, and he himself had contributed substantially to numerous funds for the benefit of the Garden.

At the time of his retirement, newspapers pointed to the way he had devoted himself energetically and unselfishly to the development of the

YEAR-ROUND SCE

IN THE

MAIN CONSERVATC

AT THE

BOTANICAL GARD

← *A section of the 90-foot dome of the Central Display House*

The flame-colored buds and gray-green leaves of Crassula falcata. ←

Lithops bella, in the Garden's collection of stone and window plants. ↓

Flowers at the base of the gigantic banyan tree in the Floral Display House.

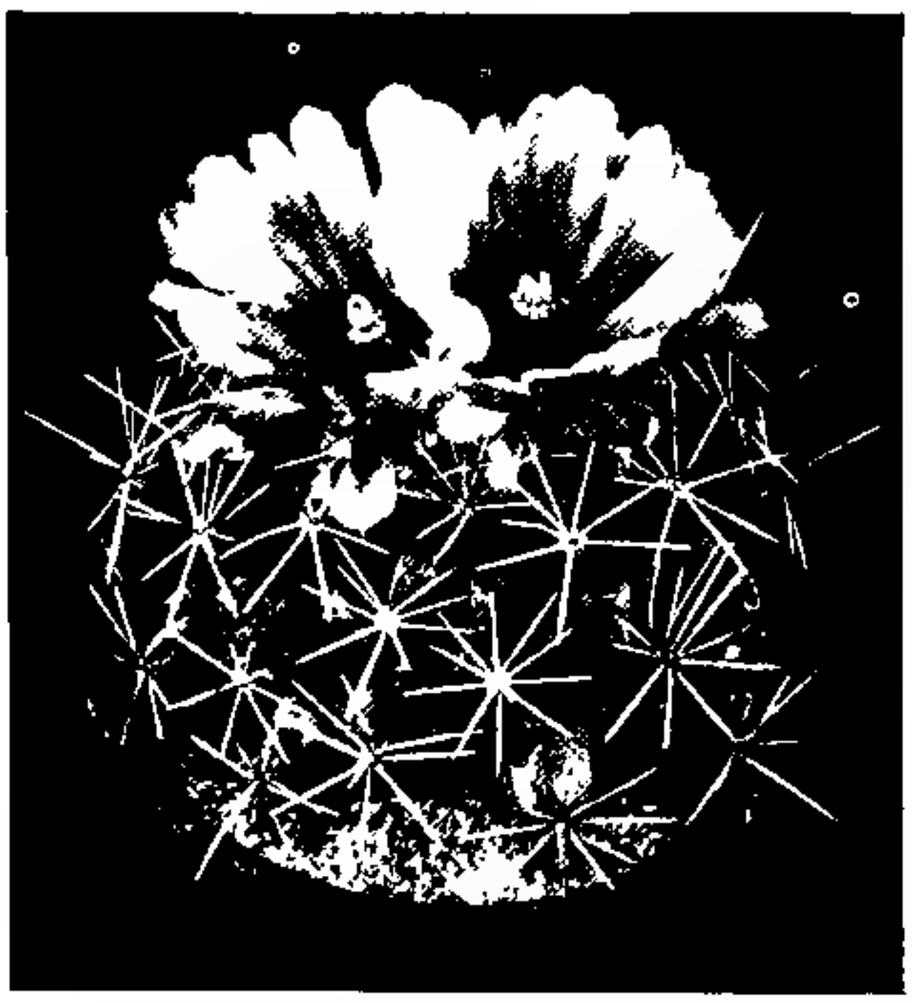
A view in the Aroid House. ↓

Leaf pattern made by Heliconia aureo-striata in the Tropical Rain Forest. →

← *Dieffenbachia Seguine in the Tropical Rain Forest House.*

One of the paths which leads through the indoor garden in the Floral Display House, open from November to June.

the new Tropical Flower Garden.



Coryphantha Muehlenpfordtii in the Cactus House.

Bromeliads growing as epiphytes on an old tree in the Tropical Rain Forest. ➔

of the large Aloes, A. Thraskii, in the

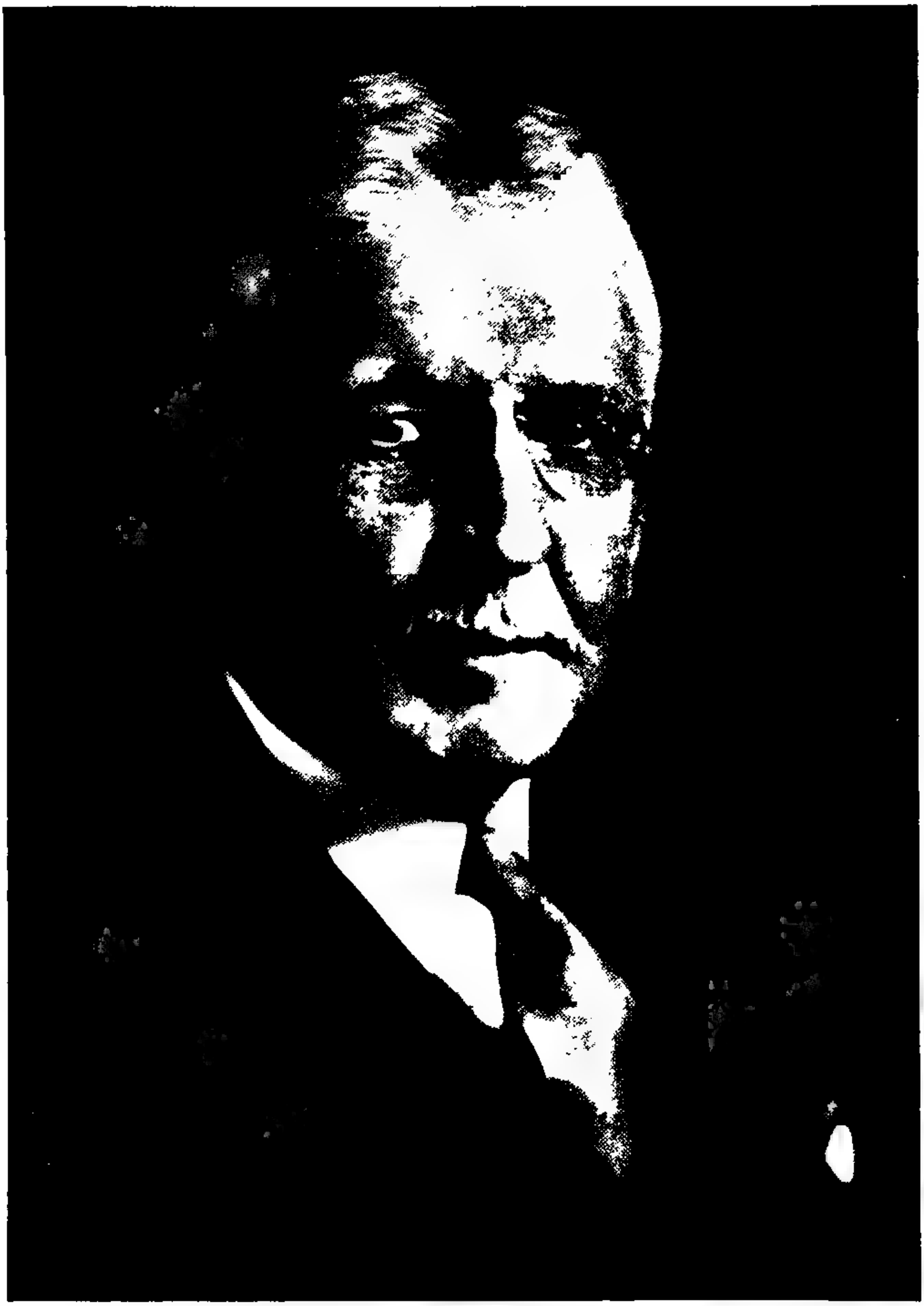
Garden. Among the accomplishments during his brief regime were the completion of a survey by Frederick Law Olmsted, with a plan for developing the grounds into "the most beautiful park in the United States"; the doubling of the endowment by the raising of $1,052,000; the adjustment of salaries and the installing of numerous improvements (including in 1926 electric lights for the first time in the museum building), and the initiation of such types of special research as are exemplified by the work on the breeding of poplars.

The period of his presidency was the time when Dr. Britton still was making annual trips to Puerto Rico and the Virgin Islands, completing the thorough botanical studies he had been making there for years. Dr. John K. Small was absorbed in investigations in Florida—expeditions which resulted in his monumental Flora of Southeastern United States and other works. Dr. H. A. Gleason spent a year at Kew, studying plants collected in South America. Dr. A. B. Stout, who had just returned from California, where he had been studying avocados, was proceeding with the initial steps in his poplar breeding work, then carried on in co-operation with the Oxford Paper Co. He had already been working since 1919 on the project of developing hardy seedless grapes for the north-eastern states, and Dr. Lee was present at a conference with Dr. U. P. Hedrick, later Director of the New York State Agricultural Experiment Station, at which time plans for co-operation were perfected.

Much of the southern part of the Garden's reservation underwent development at this time, and the first link in the fence which now nearly surrounds the grounds was completed at the boundary along Pelham Parkway.

At the time of his appointment to the presidency, Dr. Frederic Schiller Lee was Dalton Professor of Physiology at Columbia, where he had been on the teaching staff since 1891. He had been born in Canton, N. Y., June 16, 1859, was graduated from St. Lawrence College in 1878, received a Ph.D. from Johns Hopkins in 1885, spent the following year in study at Leipzig, then returned to St. Lawrence as instructor in biology for one year. From there he went to Bryn Mawr, then in 1891 to Columbia, serving first as a demonstrator in physiology, from 1895 as adjunct professor, 1904 as Dalton professor, 1920 as research professor, and professor from 1928 until his retirement. He received the honorary degrees of LL.D. from St. Lawrence in 1918 and Sc.D. from Columbia in 1929.

Meanwhile, from 1917 to 1919 he served as consulting physiologist to the United States Public Health Service and in 1918 went abroad to study industrial conditions. During his career he was on the editorial board of the American Journal of Physiology and the Columbia University Quarterly. Books that he wrote included "Scientific Features of Modern Medicine" and "The Human Machine and Industrial Efficiency." He did



FREDERIC S. LEE
1859—1939

extensive research in industrial physiology, notably the effect of atmospheric conditions on workers, and also on the physiological properties of the muscles of the ear in maintaining body equilibrium. He studied ventilation in schools for New York State during 1923 and directed research on industrial fatigue for the National Research Council and the Council of National Defense. He was the first to show the parallel between electrical and mechanical phenomena of muscular contraction.

Dr. Lee served as president of the Society for Experimental Biology, the Harvey Society, and the American Physiological Society, and as chairman of the Federation of American Societies for Experimental Biology. He was a member of the Columbia University Council from 1913 to 1920 and at one time he gave a series of lectures at Harvard and at Union Theological Seminary.

Though he had not been active in teaching for a number of years he did not resign from the Columbia faculty until June 1938.

Less than two years ago, in May 1938, Dr. and Mrs. Lee paid a visit to the Botanical Garden and made a thorough inspection of the grounds, which were brilliant with spring flowers. He was pleased to see many of the features which he had envisaged many years before taking form and substance. Mrs. Lee died six months later. A daughter, Mrs. Julia Lee McDill of Woodstock, Vt., and a son, Frederic Billings Lee of New York City, survive.

Study Course On Local Flora

A COURSE in identification of the plants of the vicinity of New York will be given on Saturdays at The New York Botanical Garden, beginning February 3, the hours to be arranged. Planned especially for teachers in the New York City schools, but open also to scout leaders, nature students, and others who are interested, this term will start with a study of trees in winter and will also give attention to the smaller forms of plant life, such as lichens, mosses, evergreen ferns, and flowering plants which maintain a rosette of green leaves on the ground all winter.

As spring approaches, flowering plants will also be studied in bloom. Several all-day field trips are planned. The course will continue until June 8, meeting on nine Saturdays and comprising a total of 30 hours of work. Arrangements have been made for alertness credit to be granted to New York City teachers.

Dr. W. H. Camp is in immediate charge of the course, in which other members of the staff will assist and Mr. George T. Hastings of Theodore Roosevelt High School also will co-operate. Besides field trips, the work will cover herbarium studies and demonstrations, and will be based on the

check-list of plants used by New York teachers. The fee is ten dollars, with teachers being admitted at half this figure. Members of the Garden who have not already taken a course during the year may register for this course without charge.

A second term will be given on nine Saturdays beginning next September.

Winter Lectures at the Garden

AFTER a three-weeks' holiday at the end of the year, the series of free Saturday afternoon lectures was resumed at the Garden on Jan. 6 with an address by Ervin S. Ferry on "Principles of Floral Decoration." Prof. Ferry is the author of two articles on Japanese flower arrangement which appeared in this Journal during 1939. The complete schedule of lectures for the winter season is as follows:

Jan. 6 ***Principles of Floral Decoration***
Ervin S. Ferry, Master of Ikebana

Jan. 13 ***House Plants For Winter Windows***
Mrs. Jerome W. Coombs, Author and Lecturer

Jan. 20 ***Bermuda: Its Scenery and Gardens***
Fred J. Seaver, Curator

Jan. 27 ***Garden Books For Winter Reading***
Elizabeth C. Hall, Librarian

Feb. 3 ***Arrow Poisons and Fish Poisons of The South American Indians***
A. C. Smith, Associate Curator

Feb. 10 ***Begonias and Their Care—With a Tour of the Garden's Collection***
T. H. Everett, Horticulturist

Feb. 17 ***Native Shrubs For Garden Use***
Ben Blackburn, N. J. State College of Agriculture

Feb. 24 ***Growing New Plants From Cuttings***
E. E. Naylor, University of Missouri

Mar. 2 ***The Folklore of Plant Names***
W. H. Camp, Assistant Curator

Mar. 9 ***Chinese Food Plants in New York***
W. M. Porterfield, U. S. Dept. of Agriculture

Mar. 16 ***Native Ferns of the Eastern States***
Farida A. Wiley, American Museum of Natural History

Mar. 23 ***Ancient Herbs in Modern Industries***
Rosetta E. Clarkson, Editor of Herb Journal

Mar. 30 ***Plant Hybrids***
A. B. Stout, Curator of Education and Laboratories

Current Literature At a Glance*

By Virgene Kavanagh

Conservation. *Australian Wild Life,* the new journal of the Wild Life Preservation Society of Australia, deals with conservation and contains descriptions and illustrations of native Australian shrubs.

For the Collector. Transparent mounts are frequently needed by private collectors as well as by museums. Small specimens may be prepared by placing them in a slot in a card of suitable size between two layers of Scotch cellulose tape. Larger specimens can be fastened to plastacele, or any other transparent material which can be purchased in sheets of approximately the weight of postcard stock, with strips of Scotch tape overlapping on the back to make a complete seal. While green plants keep their color well unless exposed to strong sunlight, the method is especially suited to small fungi on leaves.—F. W. Haasis, *Madroño,* Vol. 5, No. 4, 1939.

Fossil Pollen. A picture of the distribution of ancient plants in time and space can be reconstructed from fossil pollen grains found in peat beds. The grains can be identified and their relative numbers used to estimate the abundance of the species which produced the pollen.—Stanley Cain, *Botanical Review,* December 1939.

Small-Flowered Chrysanthemums. For more than 20 years the United States Department of Agriculture has been breeding small-flowered hardy types of chrysanthemums. In 1937 twelve seedlings were released to the trade. These were Algonquin, an early, double, yellow; Amoskeag, early, semi-double, light bronze; Barnegat, midseason, double, yellow; Geronimo, early, double, light bronze; Manantico, midseason, single, rose-colored; Muskogee, medium-early, semi-double, rose-colored; Matawan, medium-early, single, rose-colored; Otsego, medium-early, double, rose-colored; Pohatcong, late midseason, double, blush; Passumpsic, late midseason, double, blush; Seminole, early, double, white; and Suwanee, medium-early, single, white. The new types may be purchased from co-operating nurseries. — New Chrysanthemums, U.S.D.A. Circular No. 528, May 1939.

Crater Lake. The plants of Crater Lake National Park are described with a key by E. I. Applegate. He lists 570 species in 60 families and suggests how these may have come to the area.—*The American Naturalist,* September 1939.

* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

* * *

Research on Hepatics

Dr. Margaret Fulford of the University of Cincinnati, who has been doing research at the New York Botanical Garden since July, left just before the holidays to attend the A. A. A. S. meetings in Columbus, Ohio, then to return to her post in Cincinnati. Her summer work, which was done on a two-months' scholarship from the Garden, consisted chiefly of further research on the genus *Bazzania,* in which she studied about 60 types and made plates and rewrote descriptions of species. In all she has named or corrected approximately 250 Garden specimens belonging in this group of hepatics.

In the summer of 1938 Dr. Fulford also worked on a two-months' scholarship at the Garden, where the herbarium is rich in tropical American hepatics (many as yet undetermined) and the library contains most of the published material on the group.

During her recent stay in New York, her work also consisted of determining hepatics in about 60 genera for members of the staff and correspondents; compiling literature on the Javanese species of *Bazzania* in preparation for a monograph; adding about 1,000 titles and specific references to a card index on hepatics –the most complete one in America; and continuing work on recent literature on mosses and hepatics for publication in *The Bryologist.*

While in the East she spent a month at Harvard studying types of Hepaticae.

Dr. Fulford presented a paper on her work at the A.A.A.S. meeting in Columbus, Ohio.

Distributions of The Mikado Daylily

By A. B. Stout

With the co-operation of the Farr Nursery Company, which supplied the plants, a division of the ***Mikado*** daylily was, during the past summer, offered for distribution to members of the New York Botanical Garden. A total of 258 members from 14 different states applied for and received one plant each in shipments made directly from the nursery. While the requests came from as far west as California and as far south as Florida, the largest numbers were from New York, Connecticut, New Jersey, and Massachusetts in the order mentioned.

Mikado is the first of a distinctly new type of daylily for the "eyed" color pattern in the flowers. The face of an open flower is almost clear rich orange with the addition of a conspicuous "eye-spot" of purplish-red in each petal, and this combination is one of bold color contrasts. The foliage is evergreen, but the plant is hardy under the winter conditions about New York City. The scapes are branched and they rise to a height of at least three feet.

The seedling which has been propagated by repeated divisions to give this clone was obtained after three generations of selective breeding. Four different species are, by hybridizations, involved in the ancestry.

The ***Mikado*** daylily was first described in *House and Garden* for July 1929. A photograph of a plant in flower was reproduced in the *Journal of the New York Botanical Garden* in 1931. (See Volume **32,** page 29.) A description with a colored plate of the flower was published in 1930 in *Addisonia* (Volume **15,** *Plate 487*), and this plate has been lent by the New York Botanical Garden for various later publications, notably in the volume "Daylilies" and for the cover design of the volume "Garden Club—1935-1936" published by the Federated Circles of the Garden Club, Jacksonville, Florida.

At the present time there are various seedlings of later breeding at the New York Botanical Garden which have the same bold color pattern in other sizes and shapes of flower, different seasons of bloom, and various habits of growth. Some of these will be introduced in the near future.

It is hoped that others of the new types of daylilies developed at the New York Botanical Garden can be propagated to the extent that distribution can also be made to members.

* * *

Mt. Britton Tower Overlooks The Puerto Rican Scene

A tower which rests on the top of Mt. Britton in Puerto Rico at a height of 3,107 feet above sea level commands a

Commanding a view from more than 3,000 feet above the sea, Mt. Britton Tower in Puerto Rico has become a favorite goal for hikers enjoying the La Mina Recreational Area in the Caribbean National Forest.

view of San Juan, the entire northeast coast, and the Puertan Rican mountain ranges to the south and west.

A description of this stone masonry lookout, which has been erected in memory of Dr. N. L. Britton, a founder and the first Director of the New York Botanical Garden, has come to the Garden from the United States Forest Service at Rio Piedras through the courtesy of Kenneth A. Bartlett, Acting Director of the Agricultural Experiment Station at Mayaguez.

The naming of Mt. Britton, which is one of the most prominent peaks in the Luquillo unit of the Caribbean National Forest, was described in this Journal for Jan. 1935. It is within the boundaries of the La Mina Recreational Area which was developed by the Civilian Conservation Corps under the direction of the United States Forest Service. A foot trail has been constructed to the top of the mountain. From the summit the lookout tower has been recently erected to commemorate the important botanical and other work which Dr. Britton did in Puerto Rico. For some 20 years he and Mrs. Britton, often in company with other scientists, made regular expeditions there. He was chiefly responsible for launching the scientific survey of Puerto Rico which has been published over many years by the New York Academy of Sciences, and for the conservation of natural scenery and resources which has been instituted in Puerto Rico.

Because of the splendid view from the observation tower and the good foot path with trailside shelters along the way, Mt. Britton Tower has become one of the most popular features in the La Mina Recreational Area.

* * *

Conference. Two visitors to the Garden spoke at the December conference of the scientific staff and registered students, Dec. 15, Dr. Margaret Fulford speaking on "Some diagnostic characteristics of the Hepaticae as illustrated by the genus *Bazzania*" and Dr. E. E. Naylor on "Regeneration in the flowering plants."

This memorial to Dr. N. L. Britton, on the top of the mountain which was named in honor of him, was erected by the Civilian Conservation Corps under the direction of the U. S. Forest Service.

At the beginning of the foot trail leading up Mt. Britton, this trailside shelter, one of several, contains a map of the area and a place for registration.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Bringing Song-Birds Into the Garden

BIRDS IN THE GARDEN AND HOW TO ATTRACT THEM. Margaret McKenny. XVIII + 349 pages. 16 pages in full color, 32 pages in half-tone, 4 pages in line; tables, bibliography and index. Reynal & Hitchcock, New York, 1939. $5.

Miss McKenny has given us the most complete and adequate book on this subject that has yet appeared. Scholarly and imaginative, it will become a standard source-volume on attracting birds to the garden. Miss McKenny is well known for her botanical writings, so her sections on planting for bird life are especially thorough and accurate. Not only is the northeastern section of the United States treated adequately but also the southeastern, central and western states—regions rarely touched on in the popular literature.

Miss McKenny's own experience with bird life and gardens, not only in the East but also in the Far West, have prevented her from being provincial in her treatment of the subject. Although the planting end of it is the most exhaustive, the other sections are equally valuable. These touch on feeding birds in winter; providing cover for birds; building bird houses; construction of bird baths and pools; the care and feeding of stray birds; attracting water fowl; predators and the natural balance; methods of bird study; private, State, Federal and Audubon Sanctuaries, and many other closely allied topics.

The color plates are of common garden birds, chosen from the excellent series published by the University of Minnesota Press. These, together with 32 pages of "bled off" photographs, make this book a handsome, as well as useful volume.

With the current trend of garden owners to include the birds along with the trees, shrubs, and flowers as part of a balanced garden there has been a growing need for a *vade mecum* of this sort. Coming from the Northwest, where nature has its grandest sweep, Miss McKenny has acquired a point of view about song-birds that is refreshingly intelligent and never trite or oversentimental; her discussions will have the endorsement of every practical ecologist.

ROGER T. PETERSON,
National Association of Audubon Societies.

Up-to-Date Manual on Insects Of Economic Importance

DESTRUCTIVE AND USEFUL INSECTS. C. L. Metcalf & W. P. Flint. Second edition. 981 pages, indexed and illustrated. McGraw-Hill, New York. 1939. $7.50.

The second edition of this very useful book on insects follows the plan of the first edition, the authors merely adding some 60 pages and 23 new illustrations to bring the book up to date, especially with reference to certain insect pests that have come into prominence within the last 15 years.

Some topics have been slightly rewritten or enlarged in order to bring out more clearly certain features. For example, the paragraph on the mechanics of feeding by such sucking insects as squash bugs, chinch bugs and aphids now reads so that the layman can really see the difference between the methods of feeding by thrips and the aphids. Very few books on insects go into sufficient detail regarding the so-called sucking organs. The beetle carrying the Dutch elm-disease is described in the new edition and its economic importance is emphasized. This disease was not known in America at the time the first edition was published. Another added feature is the illustration of young termites and the type of destruction they cause. Simple and clear directions are given for preventing the entrance of these insects into buildings. The work of the powder post beetle, which is so often confused with that of the termite by home owners, is taken up in this edition.

The chinch bugs are discussed mainly from the standpoint of the mid-western farmer. A paragraph on the destruction of lawns in the East by chinch bugs would have been in line with other improvements of the book. The format is much the same, but the crowding of the lines makes the book somewhat less easily read.

The table showing the losses due to insects for the year 1936 indicates, when compared to a similar table showing the loss for 1924, that some advance has been made in insect control, for the loss has been reduced by $250,000,000. The estimated annual loss is still about $1,350,000,000. Where new methods of control involving new insecticides have come into use, these are included under control measures. The chapters on "Insects Attacking Shade Trees and Shrubs", "Insect Pests of Greenhouse Plants and the Flower Garden", "Household Insects and Pests of Stored Grains, Seeds, and Cereal Products", "Insects that Attack and Annoy Man and Affect His Health", as well as other chapters containing valuable information for farmers, fruit growers and growers of truck crops, are brought up to date so that they will continue to be among the most useful parts of the book.

B. O. Dodge.

Vegetation and the Civilization Of the Human Race

EARTH'S GREEN MANTLE. Sydney Mangham. 322 pages, photographs, diagrams, index. Macmillan, New York, 1939. $3.50.

Botanists will agree with Professor Mangham that "the proper study of mankind is vegetation." The green mantle of the earth is a living garment essential to all living creatures, including man. Considering the still prevalent belief that botany is the collection and naming of wildflowers, we welcome another book which attempts to make plain the real importance to human civilization of the study of plants.

The first chapter, which bears the same title as the book, introduces us to vegetation in general, taxonomically and ecologically considered. Next is a chapter on palcobotany ("Old Clothes"), then three mainly historical chapters dealing with the relations between plants and human beings and the growth of the technical knowledge of plants. These comprise an interesting and quite detailed sketch of the history of botany. They are followed by a survey of the principal aspects of plant morphology, physiology, pathology, and genetics.

Any treatment of so vast a theme is apt to degenerate into a text-book. Though Mangham is writing presumably for the general public, though his style is simple and pleasing, this book is not easy reading. The difficulty is increased by a certain discursiveness. Chapter 3, for instance, sets out from the origin of cultivated plants, drifts rapidly to Greek botanists, the herbalists, and botanic gardens, sails on into the spice trade, the wooden walls of England and the development of forestry, veers off sharply to Linnaeus and binomial nomenclature, and comes to haven finally in Kew, with a few concluding remarks about the modern branches of botany. For those who like to browse in curious facts competently presented, this is delightful; but the thread of the story is hard to follow. Errors are few and minor. The author seems curiously ignorant of the elements of Latin grammar. Parkinson, for instance, did not write a work entitled *"Paradisi in sole."*

The book is copiously illustrated. The anatomy of plants is figured in a series of beautiful photomicrographs, and numerous photographs of plants, wild and cultivated, from all parts of the earth, comprise a valuable collection. Unfortunately the desire to include the largest possible number led to excessive reduction and crowding (up to eight on one plate); their effectiveness as illustrations is largely lost, and reference to individual figures puts a strain on any attempt at connected reading of the text.

H. W. Rickett.

Physiology For Advanced Botany Students

PLANT PHYSIOLOGY. B. S. Meyer & D. B. Anderson. 696 pages, 151 figures, index. Van Nostrand, New York, 1939. $4.50.

This book, which is divided into 38 chapters with an author index and subject index, in general impresses the reviewer as the best available text for advanced classes in plant physiology. It is clearly written and well illustrated. The emphasis is distinctly on physics and

chemistry, and one has the feeling at times that it is a book on chemistry (or physics) with illustrative examples taken from the plant world. Chapters 1, 2, 3, 4, 7, 8, and 9 are almost wholly devoted to chemistry and physics, and a large part of Chapters 22 and 23 are concerned with the same subjects. It is unfortunate that it is not possible to assume an acquaintance on the part of the student with the physics, chemistry, and plant anatomy which are included as a necessary part of such a text and to emphasize more boldly the processes which occur in plants, the true subject matter of plant physiology.

Suggested collateral readings and a selected bibliography at the end of each chapter and discussion questions at the end of many add to the book's value.

W. J. ROBBINS.

A Study of Southern Trees

TREES OF THE SOUTH. Charlotte Hilton Green. 551 pages, photographs, index. University of North Carolina Press, Chapel Hill, 1939. $2.50.

It is with pleasure that we welcome a volume covering the southeast to the ranks of photographically illustrated tree books.

Since the need for books on southern trees was so great, it was not to be expected that the first of its kind would answer all the requirements—nor does the present work, for the descriptions are sketchy and some of the illustrations of entire trees are not quite typical in form.

But there appear to be only three serious errors. In giving the range of the persimmon, the northern limit is stated to be southern Pennsylvania—in actuality it is southern Connecticut. On page 161 a photograph of northern red oak is captioned southern red oak, and on page 307 a photograph of black locust is captioned honey locust. Whether these two are cases of transposition with the equivalent plates of the preceding species cannot be told as these illustrations preceding are too indistinct for recognition.

The book, however, is pleasantly written and readable and will find a place on the shelves of amateurs interested in southern trees.

E. J. ALEXANDER.

Mrs. Buxton on Begonias

BEGONIAS. Bessie Raymond Buxton. 128 pages, photographs, drawings, index. Hale, Cushman & Flint, Boston, 1939. $1.

The Begonia Club to which the work is dedicated, members of the American Begonia Society, and gardeners generally will welcome this latest book on a popular genus of plants for window gardening.

An easy style, without a semblance of text-book flavor or prosy matter, will be appreciated by begonia fanciers.

A host of species and hybrids are dealt with, but the book must essentially be considered as directed to the amateur. The descriptions are chatty rather than taxonomically exhaustive and accurate. Numerous illustrations, most of them clear, will be a helpful means of identification of species.

Four chapters deal with problems of cultivation. Although the author is not convincing in methods of maintaining sufficient moisture in the atmosphere of the modern living-room a somewhat vital requirement of certain species—yet, no end of interesting hints are set down for the benefit of the indoor gardener.

J. G. ESSON.

Artistic Flower Arrangements Pictured and Explained

HARMONY IN FLOWER DESIGN. Isabel T. Ackerman, Rose B. Housekeeper, Emma E. Thacher. 115 pages, 47 photographs by William G. Housekeeper. Dodd, Mead & Co., New York, 1939. $3.

As I read through the book "Harmony in Flower Design" I was struck by the conviction that the authors had a great appreciation for the beauty in form and color which may be found in a multitude of plant materials, and that their explanations would serve arrangements of great simplicity or extreme sophistication.

MRS. ROY M. LINCOLN.

Up to the Public

CONSERVATION IN THE UNITED STATES. A. F. Gustafson, H. Ries, C. H. Guise, and W. I. Hamilton, Jr. 445 pages, 232 figures, index and bibliography. Comstock Publishing Co., Ithaca, N. Y. 1939. $3.

Here is a non-technical presentation of conservation to students and interested

readers for the purpose of developing a broad and inclusive plan for conserving and restoring our natural resources.

Besides an abundance of illustrations, the subject matter is well organized and backed up at the end of each chapter with a series of questions designed to emphasize in the reader's mind the important points.

The introduction gives us the national picture of depletion and destruction of natural resources and a historical résumé of the first efforts toward conservation. From there, the reader is taken logically over the ground: first, the nature and kinds of soil, then the uses and conservation of water, and finally all the available information on soil depletion and erosion, pictorial and otherwise.

Now begins the constructive side of the plan: first, the general problem and meaning of soil conservation, and then all the phases of constructive conservation as it affects forest resources; western grazing lands; fish and fisheries; game and wildlife; and finally, metal, coal, oil, and gas.

This is a most timely and informative text-book, with a clear terse style and a punch which puts floods and flood control up to the public as a national social problem in a most convincing manner.

W. M. PORTERFIELD,
U. S. Soil Conservation Service.

Gardening Simplified For the Beginner

THE SMALL GARDEN: Planning and Planting for Permanence. Katharine & Arthur Storm. 233 pages, 43 illustrations from photographs, one plan, index. Frederick A. Stokes, New York, 1939. $2.50.

Mr. and Mrs. Storm have written a thoroughly delightful book, readable and useful. Their ten years' experience in building up a garden have given them plenty of first-hand material which they have set down turn and turn about.

Mr. Storm is an architect who also designs gardens. His chapters discuss design and plant material, as well as the details of garden practice. Mrs. Storm is the indoor gardener, as well as outdoor helper; her chapters derive purely from her own experience and they are fresh and enthusiastic.

The book is decidedly encouraging to the beginning gardener. The tendency today is to make gardening too difficult. Perhaps the Storms incline to make it just a little too easy, soft-pedaling the labor involved, but both of them like to do gardening outdoors and in, and, as the Architect said, "With the proper equipment, a few practical books for reference, and a love of flowers deep in the heart, anyone who is willing to get down on his knees and work can become a gardener." So the Architect and the Helper stopped gardening long enough to write a reference book for other gardeners, and have turned out a primer of real value.

MARY N. DIXON, M.L.A.

Soilless Gardening as Practised On a Commercial Scale

GROWING PLANTS IN NUTRIENT SOLUTIONS, or Scientifically Controlled Growth. Wayne I. Turner & Victor M. Henry. 154 pages, 29 figures, 3 colored plates, index. Wiley, New York, 1939, $3.

This book is primarily concerned with directions for applying commercially methods of growing plants in gravel or cinders wet with nutrient solutions.

Based on experience, it contains much valuable information for anyone who wishes to use gravel or cinders as a substitute for soil.

W. J. ROBBINS.

Notes on New Books

For Those Who Must Read German

GERMAN - ENGLISH SCIENCE DICTIONARY. Louis De Vries. with the collaboration of members of the graduate faculty, Iowa State College. McGraw-Hill, New York, 1939. $3.

A new and much-needed dictionary for students in the agricultural, biological, and physical sciences, exceptionally easy to read and gratifying to use.

Plants in the Window

THE INDOOR GARDENER. Daisy T. Abbott. 117 pages, drawings, index. University of Minnesota Press, Minneapolis. 1939. $1.50.

The author of "The Northern Garden" makes window gardening easy for the busy housewife who has little time or money to spend on plants. An abundance of useful advice is compacted into a small book.

Floral Arrangements of Every Sort

FUN WITH FLOWERS. Donita Ferguson & Roy Sheldon. 307 pages. drawings, charts, and a directory of flowers. Houghton Mifflin, Boston, 1939. $2.50.

Do's and don'ts with a flair of humor and plenty of good sense in buying flowers, caring for them, and arranging them attractively for every imaginable occasion, from making a floral necklace to arranging for wedding flowers on a budget, and including suggestions for snaring an elusive male with bouquets.

Education in the Metropolis

NEW YORK LEARNS. A Guide to the Educational Facilities of the Metropolis. Prepared by the Federal Writers' Project of the Works Progress Administration, New York City. M. Barrows & Co., New York, 1939. $1.50.

An outline of the scope of public, private, and religious schools, colleges and universities, cultural and vocational courses for adults, instruction in the arts, the educational work of numerous organizations, and other educational resources of New York City, including the work of the New York Botanical Garden through its free lectures, courses for gardeners, courses for graduate students from Columbia and Fordham, and through use of its museum, library, and collections of plants.

Monograph on the Leguminosae

THE LEGUMINOUS PLANTS OF WISCONSIN. Norman C. Fassett. 157 pages, drawings, maps, photographs, glossary, index. University of Wisconsin Press. Madison, 1939. $3.

A well-illustrated monograph of the Leguminosae which are native in Wisconsin, containing notes on their characteristics and distribution, a key to the vegetative characters, and additional keys based on the flowers, fruits, seeds, and epidermal outgrowths.

Root Nodule Bacteria

SUPPLEMENT TO ROOT NODULE BACTERIA ON LEGUMINOUS PLANTS. Edwin Broun Fred, Ira Lawrence Baldwin, and Elizabeth McCoy. 39 pages, indexed. University of Wisconsin Press, Madison, 1939. $.50.

Twenty-six pages of bibliography for a volume published in 1932, plus a list of errata, index to scientific plant names, and an index to author citations.

European Plant Geography

THE GENERAL ASPECTS OF VEGETATION IN EUROPE. Marietta Pallis. 66 pages. Taylor & Francis, London, 1939. 3s. 6d.

A monograph by a botanist with an intimate knowledge of three little known regions of Europe—the "Norfolk broad" section of England, the Plav of the delta of the Danube, and the area which includes Epirus and Albania with surrounding lands. The effect of rainfall and temperature and of animals and man upon the succession of vegetation are considered with some interesting and sometimes debatable conclusions.

Week-by-Week Garden Guide

AROUND THE YEAR IN THE GARDEN. F. F. Rockwell. New edition. 350 pages, colored plates, photographs, diagrams, index. Macmillan, New York, 1939. $3.

A gardener's manual which has been in use for more than a quarter of a century has been reissued from the 1926 edition with new end-papers and new illustrations, a number in color. Gardening tasks for every week in the year are described in chronological order, with emphasis placed on the necessity for timeliness if a garden is to succeed.

Notes, News, and Comment

A.A.A.S. Members of the staff who attended the winter meetings of the American Association for the Advancement of Science, the Botanical Society of America, and the American Society of Plant Taxonomists, held the week after Christmas at Ohio State University at Columbus, were Dr. William J. Robbins; Dr. H. A. Gleason; Dr. J. H. Barnhart and Dr. Fred J. Seaver, representing, respectively, the Torrey Botanical Club and the Mycological Society of America on the A.A.A.S. Council; Dr. H. N. Moldenke, Dr. W. H. Camp, and Frederick W. Kavanagh. Dr. Camp served as chairman of the systematic section of the Botanical Society of America and presented a paper on the development of the American floras. Dr. Seaver spoke on collecting fungi in Bermuda and was re-elected editor of *Mycologia*. Others from the Garden who attended included J. D. Dwyer, graduate student at Fordham, who presented a paper on the distribution of the Ochnaceae; Ellys T. Butler, graduate student at Columbia;

Thomas Laskaris, fellowship student of the American Delphinium Society, who gave a paper on diseases of delphiniums; and Dr. E. E. Naylor, who is spending a year at the Garden on leave of absence from the University of Missouri. Dr. A. F. Blakeslee, geneticist with the Cold Spring Harbor station of the Carnegie Institution of Washington, was elected President of the A.A.A.S. for 1940.

Charles H. Totty. A loss to the horticultural world is felt in the death of Charles H. Totty, which occurred Dec. 10 at Madison, N. J. He was born in England 66 years ago and had been in the United States since the age of 20. After eight years of working on private estates, he entered business for himself at Madison, specializing first in chrysanthemums and orchids, then later in roses, and doing both wholesale and retail business. An acknowledged authority on roses and their culture, he was chosen last June as one of the speakers at the Botanical Garden's Rose Conference. He helped to establish the first International Flower Show in New York and was actively associated with many floral societies and associations.

John Walsh. At the age of 60, John Walsh, Head Gardener for the Park Department of New York, died at his home in the Bronx Dec. 29. Frequently in close touch with members of the staff, he became a staunch friend of the New York Botanical Garden and was always a strong advocate of the interests of the institution.

Elected. Dr. William J. Robbins and Dr. H. N. Moldenke were elected to Fellowship in the New York Academy of Sciences at the annual banquet and meeting at the Hotel Astor Dec 13.

Returned. B. A. Krukoff returned Dec. 12 from a six months' expedition in Bolivia, bringing with him his usual large collections of plant specimens and samples of woods, as well as many seeds.

Emeritus. Sarah H. Harlow was named Librarian Emeritus of the New York Botanical Garden at a meeting of the Board of Managers Dec. 7. Miss Harlow retired after 25 years of service as Librarian Oct. 30, 1937.

Advisory Council. Dr. E. D. Merrill, Director of the Arnold Arboretum, addressed the Advisory Council of the New York Botanical Garden the afternoon of Dec. 6 at the home of Mrs. Arthur M. Anderson. Colored slides of the Arboretum were shown.

Lectures. "Books on Rock Gardening" was the subject of Elizabeth C. Hall before the American Rock Garden Society Nov. 15. On Jan. 5 and 6, Miss Hall attended the annual forum of Ambler School of Horticulture for Women, of which she is a graduate, taking part in the discussion on "The Gardener's Library."

Student Visitors. In two sections, Dec. 18 and 20, members of art classes at Hunter College visited the library to study examples of scientific illustrating. On Dec. 5, 20 pupils from Demerest High School, Hoboken, made a tour of the main conservatories with their instructor, L. A. Comstock.

Nursery. T. H. Everett conferred with Park Department officials and others last month on the prospect of establishing a nursery at Rikers Island.

Visitors. During December registrations in the library included the names of E. D. Merrill and Leon Croizat of the Arnold Arboretum; Robert T. Clausen, Cornell; Frank E. Egler, New York State College of Forestry; and Léon Grodsinsky, of the Division of Phytopathology, Buenos Aires. A. J. Bisaillon and Philip Chandler, the two student gardeners who went to the Montreal Botanical Garden after their graduation here, also recently visited the Garden in New York.

Parks. Allyn R. Jennings, General Superintendent of Parks and a member of the Garden's Board of Managers, addressed the Y.M. and Y.W.H.A. of Washington Heights the evening of Jan. 8 on the parks of New York City.

Dwarf Trees. A Japanese visitor to the New York Botanical Garden has sent to Mr. Stanley Ranger a volume on dwarf trees containing 150 full-page illustrations of fine specimens, some of them reproduced in color. The book has been presented to the Garden for its library.

THE NEW YORK BOTANICAL GARDEN

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FLEDA GRIFFITH ..... *Artist and Photographer*
PERCY WILSON ..... *Research Associate*
ROBERT S. WILLIAMS ..... *Research Associate in Bryology*
E. J. ALEXANDER ..... *Assistant Curator and Curator of the Local Herbarium*
W. H. CAMP, PH. D. ..... *Assistant Curator*
CLYDE CHANDLER, A. M. ..... *Technical Assistant*
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CAROL H. WOODWARD, A. B. ..... *Editorial Assistant*
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Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by complete descriptions and other pertinent information.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

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CAROL H. WOODWARD, Editor

February, 1940

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REACHING THE WORLD

The hours spent in research at a scientific institution would be of little use if the findings were not published and distributed to those who could or should make use of them.

Even an institution's program of public education is not carried out to the full unless its knowledge is spread in popular vein by means of the printed word.

Probably few of the readers of this *Journal* are aware of the extent to which the New York Botanical Garden reaches out over the world to scientists as well as to amateurs in the study of plants. Or do they realize how any one of these periodicals may, through application of the new-found scientific facts within its covers, affect the lives of untold persons far into the future in ways which are unpredictable today.

Take some of the Garden's technical publications, for example. Whenever a new issue of *Brittonia* goes into the mail, it travels into 41 countries and into 22 states to the desks of scientists who rely on it for a certain type of botanical information, chiefly relating to floristics, plant taxonomy, and ecology.

North American Flora reaches members of some 200 institutions in 23 different countries. This is the only publication in the world which aims to give a complete picture of the plants which are native or naturalized in North America, from the fungi through the flowering plants.

In a different way, scientists, professional horticulturists, and amateurs look to the New York Botanical Garden for illustrations of plants—either native ones or exotic ones that are grown at the Garden as published in *Addisonia*. There is no other periodical in America which regularly presents natural-size colored plates of flowers with complete descriptions of them in popular language. Every member of the Garden receives *Addisonia* once a year.

Members also receive this *Journal*. In addition it is carried by subscription into 39 states besides 45 countries on six continents.

Even before *Mycologia*, also published by the Garden, became the official organ of the Mycological Society of America, it reached a circle of readers extending from ocean to ocean and beyond. In 1939 it went into 43 foreign countries. The only magazine in America devoted exclusively to the fungi as a whole, it has long been recognized as one of the world's leading mycological publications. Like other technical productions of the Garden, it is carrying the findings of American research workers in botany over the rest of the scientific world.

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Geraniums In The Garden

By Virginia Wilson Vandivert

THE use of scented and fancy-leaved geraniums in the home garden has grown increasingly popular these past few years. This is gratifying to observe for they make charming border plants, and pot-grown specimens are ideal to use as "fill-ins" where a vacancy occurs in the informal garden. To grow these geraniums into plants suitable for garden borders takes time and patience. It is possible, however, and a variety can be found to thrive in every exposure and every location where the plants can get some sun.

For more than ten years the growing of scented and fancy-leaved geraniums has been an important part of my gardening activity; each year having proved some cultural point which has helped to determine the next year's work. This past summer has been the first season that I have had enough plants of each variety, combined with enough garden space, to feel that I could make a comprehensive test of all the things tried over the past years.

The outdoor garden work was started as early in May as the condition of the ground would allow. In a well drained spot in the vegetable garden, where there was no tree near enough to effect a shade till late afternoon, a bed was made having east and south exposure. The ground had been plowed and well cultivated; no fertilizer was added. The bed, which measured about 20 by 45 feet, was laid out in rows furrowed two ways, making planting hills 2½ feet apart. Between June 10th and 15th, actual planting began.

The geraniums (species, varieties, and forms of *Pelargonium*) were in four-inch pots and all were nice stocky plants. They were set out in rows with an eye to beauty as well as to keeping similar types together.

First came the forms and varieties of *Pelargonium graveolens** and their relatives in the same section of the genus: the regular rose geranium,

*While the names used here are those under which the plants are known in the trade, the general practice established in previous articles in this Journal has been followed; that is, specific names appear in lightface italic type, while names of horticultural hybrids and forms and those of uncertain origin are indicated in boldface. C. H. W.

the round-leaved rose (known generally as No. 36), the camphor rose, the variegated forms of *P. graveolens,* both rose-scented and mint-scented, the dainty little-leaved form of this species; and an unnamed red-flowering variety; also *P. capitatum,* several forms of *P denticulatum* including ***Dr. Livingston*** and ***Majus,*** the hybrid *P tomentosum* x *P. denticulatum,* ***Terebinthinaceum*** (*P. quercifolium* x *P. graveolens*), ***Blandfordianum*** (*P. graveolens* x *P. echinatum*), ***Attar of Roses, Elkhorn, Fragrantissimum*** and ***Snowflake.***

Then came the citrous-scented: *P crispum,* ***Mellisinum*** (probably *P crispum* x *P graveolens*), known as the balm-scented geranium, ***Prince Rupert*** and ***Variegated Prince Rupert, Limoneum, Citriodorum*** var. ***Prince of Orange, Dennisianum,*** and ***Vandesiae.***

All the fruit-, spice-, and nut-scented ones were put out next: *P. odoratissimum, P fragrans, P. odoratum* var. ***Lady Mary,*** *P. scabrum* var. ***M. Ninon,*** *P. fulgidum,* var. ***Old Scarlet Unique,*** also ***Godfrey's Pride, Countess of Scarborough, Grossularioides, Rollinson's Unique, Pretty Polly,*** and ***Schottesham Pet.***

Last came the group of pungent and odd varieties: the hybrids and forms of *P. quercifolium,* such as ***Giant Oak, Fair Ellen, Prostrate Oak, Pinnatifidum, True Oak, Fringed Oak,*** and a light-green-leaved oak type of prostrate habit; also *P filtrum* var. ***Mrs. Taylor,*** *P. cucullatum, P fissifolium, P. alchemilloides,* ***Jatrophaefolium*** (*P. denticulatum* x *P. glutinosum*); ***Skelton's Unique, Mrs. Kingsley, Beauty, Capri, Clorinda,*** *P tomentosum,* and two varieties of *P. scandens.*

Mixed in all these rows where varieties ended and spaces were left, were planted the fancy-leaved geraniums: ***Mrs. Parker, Mrs. Languith, Black Douglass, Mary Ann, Beckwith Pride, Hills of Snow, Mountain of Snow,*** variegated ***S. A. Nutt, Skies of Italy, Mrs. Pollock, Jubilee, Jean Packer, Alpha, Bismarck, Distinction, Mrs. Cullum, Bronze Beauty, Happy Thought,*** and the ***Marshall McMahons.***

All of these plants were taken from the pots and carefully planted with plenty of water in the holes and loose earth on top. They were then not watered for a week, and though the sun was hot and there was wind they did not wilt. At the end of the week the whole bed was soaked, being given water as long as the ground would absorb it. Surface cultivation was done regularly to keep the smallest weed down and the ground loose. A thorough soaking once a week was continued as long as it was needed.

After they had been in the ground a month and seemed settled they were all given a light application of nitrate of soda. The green varieties responded at once; after their new growth was started, extra feeding of liquid cow manure was given after each watering.

By the end of July all the green varieties were growing into beautiful

plants, proving they liked open spaces and full sun. The green of the leaves seemed deeper, and the lovely dark shadings on certain varieties glowed with intense color. The prostrate varieties hugged the earth and sent runners out in every direction, making handsome mounds of twining plants.

Of the silver-leaved sorts in the garden beds, ***Lady Plymouth*** and ***Snowflake*** (varieties of *P. graveolens*) alone were doing well. These kept pace with the green-leaved geraniums. The other variegated-leaved sorts were almost retiring into themselves—curling their leaves, turning brown, and in every way that they could showing that they were completely unhappy. ***Blandfordianum*** wilted each day and looked ragged and poor. So these were all lifted one damp morning, potted, and the pots were sunk into the earth along a grape arbor where they would have protection from the wind and would have only part-day sun. They were given extra care in the way of water and were regularly fed. They began to improve at once and ended the summer in satisfactory form.

September found the rows in the garden bed a solid mass of leaves; the plants vied with each other to close the paths, which were kept open only by crosswise traffic. Many of the plants were three feet tall, and blooms were in evidence on almost all of them. The prostrate ones met and intermingled in luxuriant growth.

When the geraniums had been planted in the garden bed, some of each were kept for trial in other exposures, also for pot plants to use as "fill-ins" and for decoration on the porches. No geraniums planted full in the shade did well. They lived, but were thin-leaved and remained small plants; any growth which was made was poor and leggy.

The scented geraniums with purple zones need sun to bring the color out. On a north porch where the sun reaches them in the afternoon they make a good showing, but are not to be compared with the same varieties on the south porch. The rose and the skeleton geraniums are the most adaptable and will stand more shade than the fancier ones.

The plants which had been kept in reserve for border vacancies were not removed from their pots, but when a vacancy occurred a plant was plunged, pot and all, into the earth. The varieties used for this purpose included ***Snowflake, Beauty, Schottesham Pet, Mrs. Taylor,*** and forms and varieties of *P. quercifolium* and *P. graveolens.* These were all excellent pot plants. ***Snowflake*** does not burn even in full sun; ***Schottesham Pet*** blooms constantly, as does ***Mrs. Taylor.*** ***Beauty*** was especially lovely but took up a great deal of room; its branches spread out so far.

The variegated ***Madame Salleroi*** was given a thorough trial as an edger. Eighteen plants were set out during the week of June 15th, along a border where they would have all-day sun. They were planted in the same way as the geraniums in the garden bed, and were given the same

treatment. They began to grow at once, forming round tufts of firm green and white leaves, which did not burn or discolor.

These plants grew to a tremendous size and were very beautiful; their leaves were of almost a parchment texture. Although they are not supposed to be flowering geraniums, two of the plants bloomed, the small tubed florets borne in umbels held high above the foliage, on long stems.

On a west porch some two dozen plants were kept. They were potted in large glazed pots and were placed near the edge of the porch, each getting a half day of sun. These were lovely—none bloomed, but they made handsome plants of firm growth. They were all fed regularly, and were watered enough to keep the ground slightly moist.

Handling the green-leaved geraniums and two of the variegated ones, ***Lady Plymouth*** and ***Snowflake,*** was comparatively easy; and very satisfactory wherever they had full or half-day sun, water when necessary, and enough fertilizer to keep them growing. They had no blight or pest that a simple spray did not quickly destroy.

The fancy-leaved geraniums were harder to place. The ones in the garden had to be moved to a half-shaded spot. They do not like wind, and they need very little water, just enough to keep the ground damp under the loose top earth. They did best of all in an eastern exposure, where protected from the wind and having early morning sun they bloomed freely. They seem to have no pests to bother them. ***Mrs. Pollack*** is the most sensitive to dampness on the leaves. In full light, with half-day or morning sun they came to beautiful coloring. I have been told that these will grow and bloom anywhere in the garden. They may, but I doubt if they will in the climate of New Jersey. Blistering sun, cold winds and pelting rain killed every one left in the borders. Several were in pots on the west porch where they grew beautifully. These fancy-leaved varieties seem a less hardy race, but are worth every bit of work put on them. The variegated ivy-geraniums grew full-leaved and red-tinged, spreading out their leaves for all to see their beauty.

Early in the summer, cuttings of all the geraniums in the collection were put in sand to root. As these were ready they were taken from the cutting bench, potted, and kept in the greenhouse until around August 1. They were then set out in the pots, in a good sunny location. These were watched and watered, and they grew into splendid little plants; they were generally too young to bloom, but were ideal to take up in September for winter use.

The only spraying that was necessary was a spray to check leafhoppers. A nicotine solution was used and seemed effective.

One fact which was gratefully observed and which caused much comment was the freedom from Japanese beetles in all the garden area where the geraniums were planted. Actually the only geranium which was bothered was the variety ***Schottesham Pet.*** From this variety it was

A section of Mrs. Vandivert's garden at Colonia, N. J., where she is cultivating more than 75 different kinds of geraniums.

necessary to pick the beetles several times during the last of the summer. All the other varieties were entirely free, and the bushes, vines, and trees surrounding them were noticeably freer than those in other parts of the place.

Summer is so short in New Jersey. Frost danger necessitates waiting until June 1st to 15th to put out geraniums and also makes it necessary to take them up in September. In transplanting large plants, trimming both top and roots has never been sucessful for me, and transplanting them without trimming has always been too difficult to attempt. From the plants which were too large to handle, cuttings were taken from the firmest stalks.

The plants chosen to be taken up were the smallest in the garden bed. These were lifted on a damp morning with as much soil as was needed to keep the roots covered. Each plant was potted as soon as it was lifted from the ground and the pot was filled with very finely sifted potting earth. Each geranium was labeled, staked if necessary, and watered; then set in a protected, shaded place to recover from the shock of moving.

The cripsums and quercifoliums made the change from the garden bed to the greenhouse with the greatest ease and fewest fatalaties. No more trimming than was absolutely necessary was done on these.

The little potted plants which had been set out August 1st were all moved directly into the greenhouse; they never stopped growing. There

was a small loss from cutworms and some disturbance from earthworms. These were looked for as soon as the leaves on a plant began to wilt—and by turning the plant out of the pot they were easily found and destroyed.

With plants of all the varieties of the geraniums safely housed in the greenhouse, the summer's work is ended and the winter's work begun. During the winter days there are bound to come thoughts for improvements in the next summer's garden—and I shall want to try all of them. However, there are three things which will require no further experimenting. I know that I will have a sunny garden bed where rows and rows of green scented geraniums can grow beautiful, as they did this past summer; a large bed where the fancy-leaved geraniums can have the morning sun that they need; and I shall have as many potted geraniums as I can spare —for decorative uses or to plunge into the borders whenever a vacancy occurs.

The geraniums (pelargoniums) mentioned in this article and a few others being grown in the same garden may be classified descriptively according to the lists below. Several kinds will be found under more than one category.

Variegated-leaved scented varieties (including round-leaved, cut-leaved, and small-leaved forms)

Green combined with white or cream (the white ones often spoken of as "silver-leaved")

GRAVEOLENS VARIEGATED, both rose- and mint-scented
LADY PLYMOUTH
SNOWFLAKE
CRISPUM var. PRINCE RUPERT VARIEGATED

Mottled

GROSSULARIOIDES

Variegated-leaved zonal varieties (often listed as "fancy-leaved")

Dark-zoned or tri-colored varieties

MRS. POLLOCK
MRS. CULLUM
JEAN PACKER
BLACK DOUGLASS
BRONZE BEAUTY
BISMARCK
SKIES OF ITALY
JUBILEE
MARSHALL MCMAHON
ALPHA
HAPPY THOUGHT
DISTINCTION

Green and white varieties (often called "silver-leaved")

MRS. PARKER
MARY ANN
MOUNTAIN OF SNOW
MRS. LANGUITH
HILLS OF SNOW
VARIEGATED S. A. NUTT

Mottled

BECKWITH PRIDE

Variegated ivy-leaved varieties

Green and white

SUNSET and an unnamed large-leaved variety

Pink

An unnamed green-leaved variety with a pink center

Prostrate varieties (plants of viny growth which trail along the ground or hang from pots—most of them varieties of *P. quercifolium*)

PROSTRATE OAK
LIGHT-GREEN-LEAVED OAK
FRINGED OAK
SKELTON'S UNIQUE

Silvery-pubescent variety

BLANDFORDIANUM

Rose varieties (*P. graveolens* and all that have either a rose scent or the leaf-shape of this species)

VARIEGATED GRAVEOLENS (both rose- and mint-scented)
LADY PLYMOUTH
LITTLE-LEAVED ROSE
ROUND-LEAVED ROSE (No. 36)
TEREBINTHINACEUM
ATTAR OF ROSES
CAPITATUM
CAMPHOR ROSE
RED-FLOWERING ROSE
BLANDFORDIANUM
TOMENTOSUM x DENTICULATUM
SNOWFLAKE
FRAGRANTISSIMUM

Skeleton-leaved varieties (P. *denticulatum* and its varieties)

DR. LIVINGSTON
VARIETY NO. 2
MAJUS
VARIETY NO. 3
VARIETY FROM KEW

Purple-zoned scented-leaved varieties

BEAUTY
SKELTON'S UNIQUE

Also the following *P. quercifolium* varieties

GIANT OAK
PROSTRATE OAK
FAIR ELLEN
TRUE OAK
PINNATIFIDUM

* * *

Guadeloupe—Emerald Of The Antilles

In the necklace of islands known as the Lesser Antilles, extending from Puerto Rico to Venezuela and representing the eastern remnants of a land-mass which once connected North and South America, Guadeloupe lies like an emerald pendant in the chain. Here for a time were the headquarters of Professor Henri Stehlé, who makes important plant collections, some of which are sent to the New York Botanical Garden. Monsieur Stehlé is now Professor of Agriculture at the Jardin d'Essais (Tivoli), Martinique, and is a collaborator of the New York Botanical Garden.

The French Antilles, which are the principal field of his operations, include Guadeloupe and its dependencies, Les Saintes, Marie-Galante and La Désirade close by, and farther away to the north St. Barthélemy (St. Barts) and St. Martin. To the south, beyond the British-owned island of Dominica, lies Martinique, also part of the French Antilles. M. Stehlé gives us here a sketch of his botanical explorations in certain of these islands against a background of the geography, the people, and their principal cultivated crops.—C.H.W.

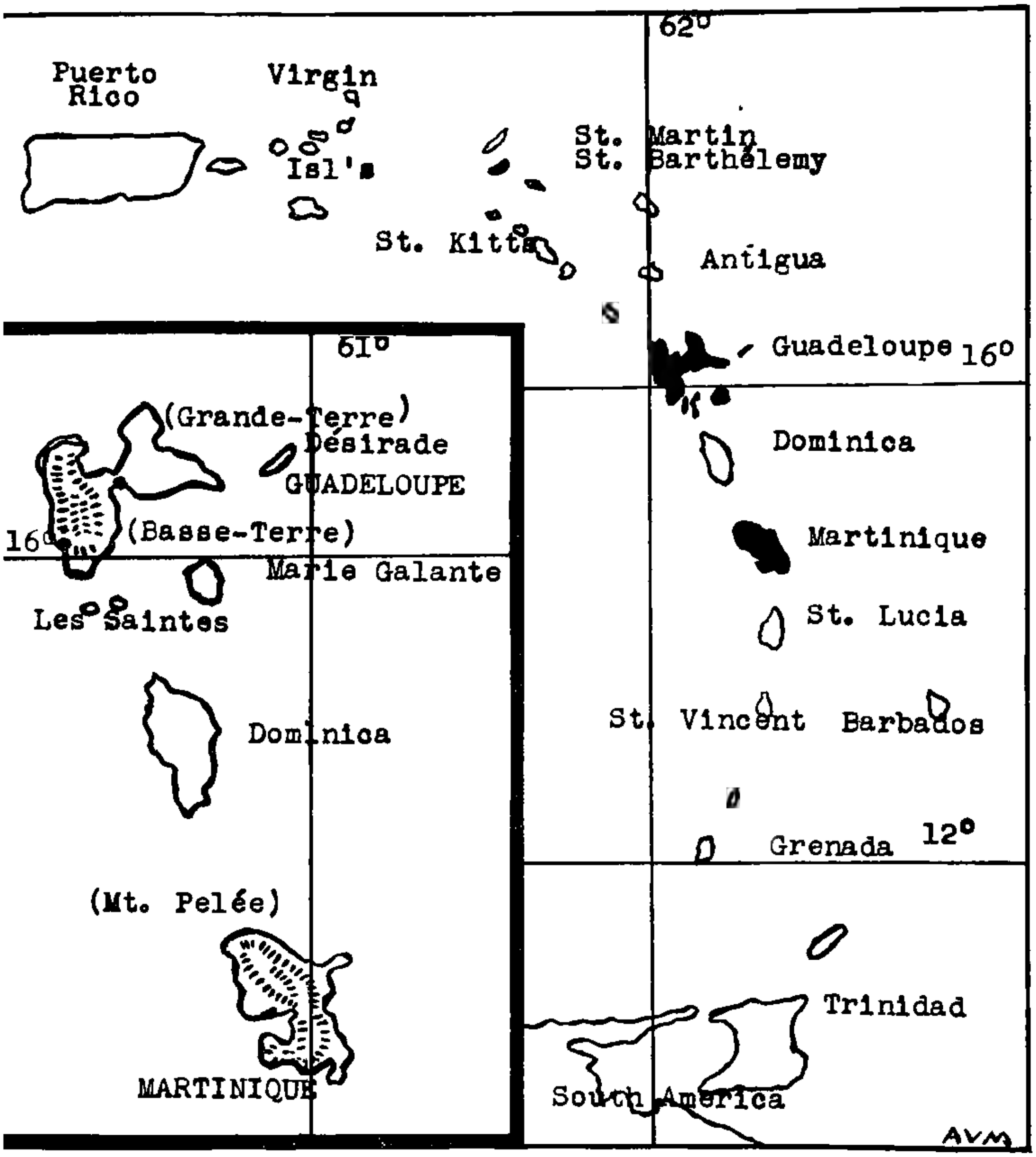
A Botanist's Picture of the French-Owned Islands Between the Americas

By Henri Stehlé

FOR the last four years my wife and I, with the collaboration of the Reverend Father L. Quentin, have gone through the fine forests and among the hills and mountains of Guadeloupe and its dependencies studying and describing its rich and varied flora.

Guadeloupe consists of two islands scarcely separated by a narrow inlet called la Rivière Salée (Salt River). These two islands are botanically very different. Guadeloupe itself, also called Basse-Terre ("Low-Land," though it is the highest one), is volcanic, wooded, and very difficult to traverse, while the Grande-Terre ("Large-Land") is calcareous, but little wooded and mostly planted with sugar-cane.

It is in the dense wet forest in the central part of Guadeloupe that we can find rare endemic species and also occasional novelties, of which a nearly complete enumeration has been made possible by the collections of Doctor L'Herminier, Physician Duchassaing and chiefly the Reverend Father Duss. Here one may see primitive forests, for instance, those of Fumée near the St. Louis River, the Montiberge forests around Vernou in the Petit Bourg mountains, and those of the Terre-Plate in the Lamentin district. There are other primitive forests, among which may be mentioned the beautiful Bains-Jaunes woods above St. Claude; those which surround the Grand-Étang (pond), Étang Jone, and Étang Zombi; at the Grand Carbet falls; the Dugommier and Palmiste plateaus; the Sofaya and Ravine Chaude Baths; the slopes, tops and higher volcanic cones such as the Soufrière, (1,484 meters, the culminating point of the French West Indies); as well as the Échelle, the Citerne and the Grande Découverte.



Altogether, these regions furnish a marvelously beautiful landscape for the tourist and are botanically of the greatest interest to the collector, for they support a dense population of trees of numerous species which in turn are covered with epiphytes, consisting of flowering plants, ferns, and mosses which live not only on the bark of the trees but in some cases even cling to their leaves. The special features of this vegetation are the tree-ferns and the shrubby species of plants in the Aralia family, their

elegant leaves besprinkling the forest with light spots, also the abundant and various shrubs, the herbaceous and epiphytic members of the Pepper family (Piperaceae) and the terrestrial and epiphytic orchids.

Among the 63 species of Piperaceae which may be found today in Guadeloupe, more than 50 are located in the wet forests of Basse-Terre and 34 of these are endemic to this island. It is principally in the Bains-Jaunes woods, near the Ravine Malaga and Dugommier, where the endemic Piperaceae described by C. de Candolle and those recently named by Professor William S. Trelease from our collections may be seen.

The saturation of the atmosphere and the very high rainfall (reaching a yearly average of about ten meters at the Soufrière), coupled with very poor air circulation and low light intensities, favor the abundant growth of ferns such as the genera *Hymenophyllum* and *Trichomanes* with their leaves only one cell thick.

Of the orchids, 105 different species are represented, among which 11 are endemic. Nearly all of the orchids inhabit the forest and belong mainly to the genera *Pleurothallis, Epidendrum*, and *Habenaria*. One may also find tiny species of the chiefly tropical Burmannia family, including three rare leafless plants—*Apteria hymenanthera, Gymnosiphon Germaini and G. sphaerocarpus*—which live as saprophytes on rotting trunks and branches, or as parasites on the roots of the forest trees.

The plant associations of Guadeloupe vary from the dry land, or xerophytic, "bush" of the leeward coast which extends from Basse-Terre to Deshaies above Pointe Noire, to the extremely moist, or hygrophytic, growth in the successively wet, rainy, and mossy forests. One also finds the intermediate, or mesophytic, forests of the basaltic Houelmont Morne, Gros Morne de Deshaies and Ste. Rose hills, as well as a stunted forest, a high savannah, and a sphagnetum in these islands.

At some points, however, disturbances provoked by man during the establishment of cultivated areas and later enlarged by cyclones (notably those of 1896 and 1928) contribute more and more to the disappearance of the primitive features of these forests, where once the wild pre-Colombian Caribees camped in their *ajoupa* made of branches and leaves. The sparkling Vauchelet cascade, once like a diamond in its setting of luxuriant verdure, is no more the botanist's paradise of which Père Duss spoke. And on the thick humus which once bore them, the giants of the forest, the "acomats," "big trunks," (*Sloanea caribaea* and *S. Massoni*) and enormous "resolus" (*Chimarrhis cymosa* var. *genuina*), lie where they were violently thrown down. Verdant banana plantations now extend along the mountain flanks but between them, kept as screens from the wind, are remnants of the cleared forest.

Characteristic species of these windbreaks are "pois doux," (*Inga laurina*), the West Indian "sweet peas"; "suyaux," (*Acnistus arborescens*), a shrubby tree of the Potato family; "graines bleues" or "blue-

seeds" (*Symplocos martinicensis*), and "cafés-marrons," "coffee-chestnuts" (*Rudgea caribaea*); and on them all we can collect rare epiphytic orchids and ferns. This is particularly true near Galion and Ravine Chaude de Dugommier, at la Regrettée and l'Ermitage (Trois Rivières), at l'Espérance (Capesterre), at Vernou and especially at Montebello (Petit-Bourg) where, with both art and science, a real botanical and zoological garden has been organized by M. Adrien Questel.

The Grande-Terre presents a very different landscape, with dry calcareous hills called "mornes," and some dales and alluvial valleys which are more fertile, such as the "Grands Fonds" overhung by hills, the highest of which is Masselas, only 120 meters high. There are also chapparal areas composed of "mapous" (*Pisonia*), also called "mampoo"; "bois vinette" (*Erythroxylon*), related to the plant producing cocaine; "mimosas" (*Acacia*); "poiriers (pear-trees) des Antilles" (*Tabebuia*), a showy shrub or tree related to the trumpet-vine, *Bignonia*; and "petites baumes" (*Lantana* and *Croton*), both of which in English are occasionally and curiously known as "sage." On these hills, between St. François and Ste. Anne, new species of Piperaceae have been collected.

The stations most worthy of botanical study are the important coral reefs and madreporic north cliffs: Portes d'Enfer, de l'Anse Bertrand, Piton, and la Pointe de la Vigie; the eastern reefs: Pointe des Chateaux, the ponds of St. François and Morne à l'Eau, and the fresh water pools. These pools, the largest of which is Étang Cocoyer at Moule, contain some rare hydrophytic plants such as *Utricularia obtusa, Hibiscus sororius*, and *Hydromystria stolonifera*, mixed with the cutting-sedges ("herbes coupantes"), *Fuirena umbellata* and *Mariscus jamaicensis*. The mangrove swamps spread on the large surfaces of the littoral ooze, but their constitution is the same as that of the others in the West Indian islands.

The neighboring dependencies of Guadeloupe are la Désirade, Marie-Galante and Les Saintes, while the more distant dependencies are Saint-Martin and Saint Barthélemy (St. Barts), toward the north of the Lesser Antilles Archipeligo.

On these now densely populated islands the aboriginal red men disappeared long ago, having been destroyed by the warring Caribees from the Orinoco. These vanished in turn upon the arrival of Europeans more than three hundred years ago, when they were decimated in a war, and only a few of them survived on a reservation in Dominica. The last of them took refuge in the mountains where the primitive type gradually disappeared. The present population, locally known as creoles,* is partly descended from slaves brought from Africa by the white men. Much interbreeding took place after the abolition of slavery when Hindu laborers were introduced in the French Antilles at the end of the last century.

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* The word "creole" as it is used here bears no relation to the meaning of the word in the United States, where it chiefly applies to French-speaking white inhabitants of Louisiana of either French or Spanish descent.—C.H.W.

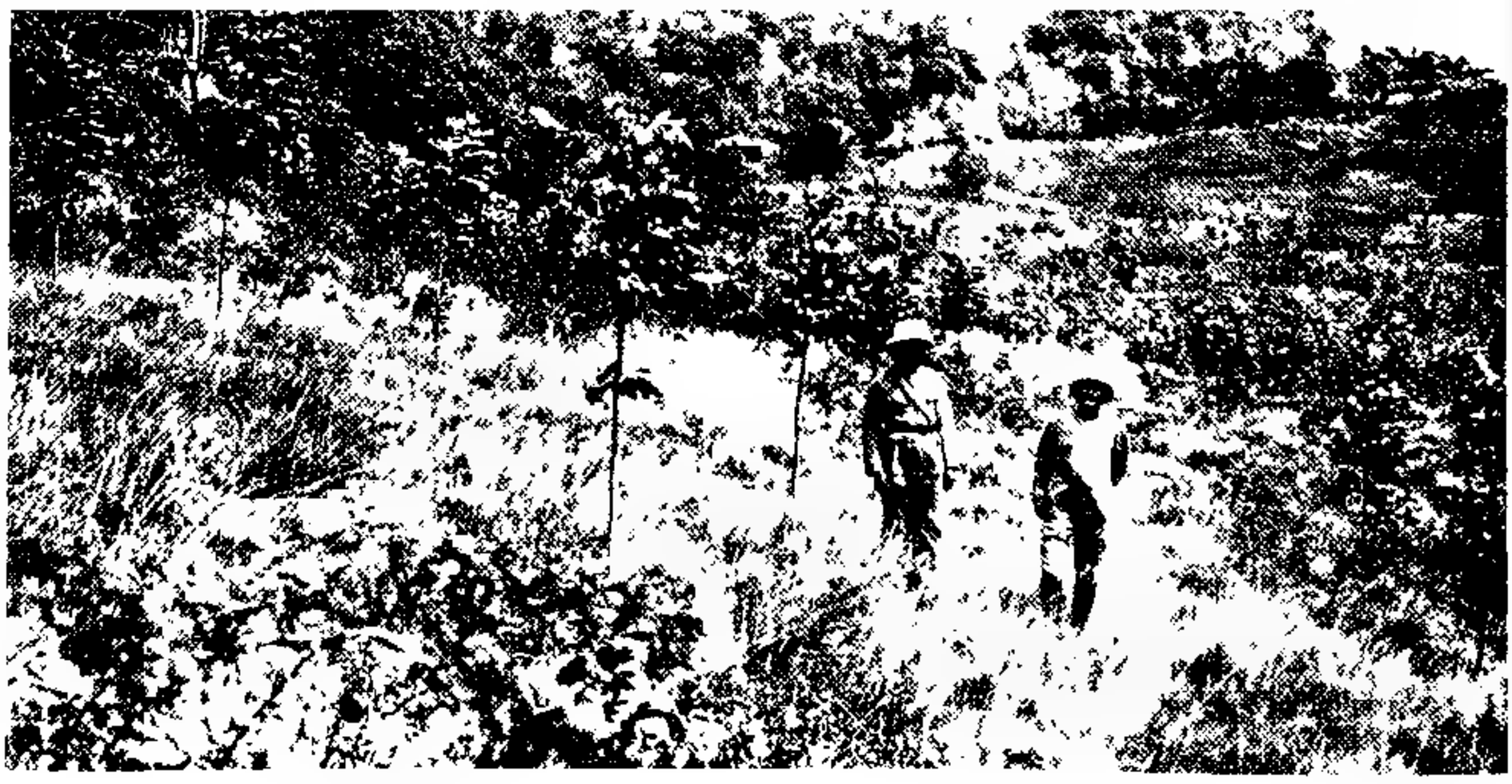
Cephalocereus Urbanianus, a tree-cactus frequently seen.

Photographi

by

Kervégant

The edible sea-grape, Coccoloba uvifera, growing on a dry wind-swept slope.



SCENES

IN THE

FRENCH

ANTILLES

Acacia-covered slopes in southern Martinique.

Henri Stehlé amid indigo bushes in the Antilles, with acacia in the background.

Left and right:

Plantations of the native long-fibered cotton, Gossypium barbadense.

Many Indian types have thus been naturalized in these islands so far from Hindustan, where they live as they did in their country of origin.

The inhabitants here have for many years raised sugar-cane, with banana cultivation introduced rather recently. The first crops raised were indigo (*Indigofera tinctoria* and *I. Anil*); cotton (*Gossypium barbadense* and *G. Marie-Galante*); tobacco (*Nicotiana tabacum*) and annatto (*Bixa orellana*), this last for the dye which is used chiefly to color butter and cheese.

In the dry and moderately humid regions of Martinique and Guadeloupe, sugar-cane culture predominates. Both rum and sugar are produced from it, and one finds factories and distilleries run in a modern manner in both these colonies. In the moister regions, both near the sea coast and at high altitudes, mixed crops, like bananas, coffee, cacao and vanilla, are cultivated but that practice tends to disappear in favor of the raising of bananas alone. A few coffee plantations still exist, *Coffea arabica* at Guadeloupe, where the grain is of excellent quality, and *C. liberica* at Martinique where the grain is less fine but the production is greater. Pineapple is cultivated at Trinité, St. Joseph, and Gros Morne on Martinique, at Ste. Rose, and in the Lamentin district of Guadeloupe on soils wliich are undergoing lateritization, that is, the process of decay of the native rocks into a red soil, high in oxides of iron and hydroxide of aluminum. Manioc, tapioca, or cassava (*Manihot esculenta*); yams (*Dioscorea* in several species); malangas (*Xanthosoma,* in several species), a taro relative; pigeon-peas (*Cajanus bicolor*); bread-fruit (*Artocarpus communis*); and sweet potatoes (*Ipomoea Batatas*), all play a large part among local food products. It would be desirable to encourage limited cultivation of more fruit plants from tropical and warm temperate regions. These should include the Seville orange (*Citrus aurantium*), grapefruit (*Citrus grandis*), papaw (*Carica Papaya*), mammee-apple (*Mammea americana*), litchi-nut (*Nephelium Litchi*), Otaheite-apple (*Spondias*), custard-apple (*Annona*), rose-apple or Surinam cherry (*Eugenia*), Barbados-cherry (*Malpighia*), avocado (*Persea*), coconut (*Cocos*), passion-fruit (*Passiflora*), persimmon (*Diospyros*), and especially the many varieties of mango (*Mangifera indica*) of which the most appreciated are ***Julie, Divine, Reine, Amelia, Sabot,*** and ***Mangue d'Or.***

But my chief interest lies in the great variety of plants which may be found in the wilderness. The geological history of these islands gives them a flora which, while often related to both North and South America, still consists of many endemic species, most likely developed since the land became a series of islands.

These islands are chiefly volcanic and their emergence is dated from the Miocene and Tertiary, at a time when a rich flora already existed on nearby islands which had previously emerged (such as Puerto Rico), whence seeds were able to migrate. The paleotropical and neotropical floras were

A characteristic scene in the mountainous regions of the French Antilles, where the walls of the narrow valleys are an entanglement of verdure.

already differentiated. Because of its position, there is reason to suppose that the Isthmus of Panama did not figure as much as the archipelago of the Antilles in the dispersion of archaic species of ancient families between the North and South American continents.

Désirade, the first land that Columbus sighted on his second western voyage, is a narrow, long, dry island. Its vegetation is littoral, xerophytic

and ruderal—characteristic of waste places—on the calcareous "mornes" and looks like that of the volcanic hills of Deshaies toward le Grand Nord and la Grand' Rivière. All along the Ravine Cybèle, one may find such rarities as *Gundlachia corymbosa,* a sort of goldenrod known as horsebush or sereno; *Agave Dussiana,* one of the century plants; *Dodonaea Ehrenbergii,* a resinous shrub locally known as dogwood; *Oncidium intermedium,* an epiphytic orchid; and *Tetramicra canaliculata,* a terrestrial orchid, all species which in the region of Guadeloupe are seldom found outside of Désirade. Here a hyperxerophytic association of Cactaceae reaches its biological maximum. Among the outstanding cacti here are *Echinocactus intortus* and *Cephalocereus Urbanianus,* found in the place called "Le Désert," between the leper-hospital and the Montana lighthouse.

The island of Marie-Galante, larger but flatter than Désirade, is geologically formed from marine sediments of the Miocene period. Its original vegetation consisted mainly of xerophytes or heliophytes, plants which could thrive either in dry places or in full sun, but it is now mixed with plantations of sugar-cane and the local species of cotton (*Gossypium Marie-Galante*). Some important forest relics occur in the South, as between Grand-Bourg and Capesterre, the Hauts, and above all, in the excellent littoral mesophytic forest of Folle Anse near Saint-Louis, where the showy-flowered evergreen tree, *Tabebuia pallida,* and the Guiana plum, *Drypetes serrata,* are found.

Several small basaltic and labradoritic islands, resembling sugar loaves, constitute the picturesque archipelago of Les Saintes, among the more interesting being Terre-d'en-Bas and Terre-d'en-Haut. In this last island the Morne Chameau (320 meters high), covered with such shrubs as *Croton Astroites* and *C. coryifolius,* also possesses many rare species, among them the fragrant *Brunfelsia fallax*; *Ardisia guadelupensis*; the orchid, *Epidendrum ciliare*; the acanthus relative, *Justicia androsaemifolia*; and an endemic pepper, *Peperomia dolosa.*

Saint-Martin and Saint Barthélemy (St. Barts) are two dry, calcareous islands whose flora is much like that of the Virgin Islands with some additional special plants, such as *Calyptranthes Boldinghii,* of the Myrtle family; the leguminous *Galactia nummularia; Erythroxylon ovatum* var. *angustifolium;* and a new piperaceous species recently collected in Saint Barthélemy at Grands Fonds by M. Questel, which we have named in his honor.

But to enumerate the many species of the rich flora of these islands of the Antilles is not enough. One must see them; one must traverse their cactus-filled deserts, clamber over their verdant hills, venture deep into their jungles, and stand on the tops of their mist-washed peaks to understand the richness of the flora there.

The Arrowhead As a Food Among The Chinese

By W. M. Porterfield

(No. 8 of a series on Chinese Vegetable Foods in New York)

THE small tubers of two species of arrowhead (*Sagittaria*) are found in the Chinese food shops of New York. The one that is native in China (*S. sinensis*) [1] is in greater demand and is more frequently found than the other (*S. latifolia*), which the Chinese have come to know only since they have been in America.

The tuber of the Chinese species resembles a small onion about two inches in diameter and a little more than an inch in height.[2] The photograph shows a shoot projecting from the center and two lines encircling the tuber, indicating the basal origin of the sheathing leaves.

Tubers of the North American plant (*S. latifolia*), which are found in the Chinese market in November only as a seasonal vegetable, have been eaten in this country since early times. The Lewis & Clark expedition in 1804 found the Chinook Indians of Oregon using it as a food mainstay, and in 1852 Perry noted this plant in the diet of the Chippewas.[2] It grows commonly throughout the country in stagnant pools and standing water. Its distinctive features are a lateral flattening, an elongated sprout that projects from one end, and two to four leaf-base scars that show the position of the buds and encircle the tuber.

The leaves, which are arrow-shaped, as the generic name signifies, have an obtuse apex and divergent basal lobes and distinctly five-ribbed petioles.

The tubers of *S. sinensis* germinate without difficulty, as can be judged by the leaf habit shown in the photograph of a plant grown in a submerged pot kept in the propagating house. From my experience *S. latifolia* does not grow as readily. Its leaves are larger, with semiterete petioles and not such pronouncedly divergent lobes.

The arrowhead, called T'zu-Ku by the Chinese, is well described in the Pen-tsao. Modern botanists have identified it under a number of different names, among them *S. trifolia* [3], *S. macrophylla,* and *S. sagittifolia.*

Wilson [4] noted its cultivation for tubers in the provinces of Szechuan and Yunnan. The arrowhead is cooked and eaten in the same way as the

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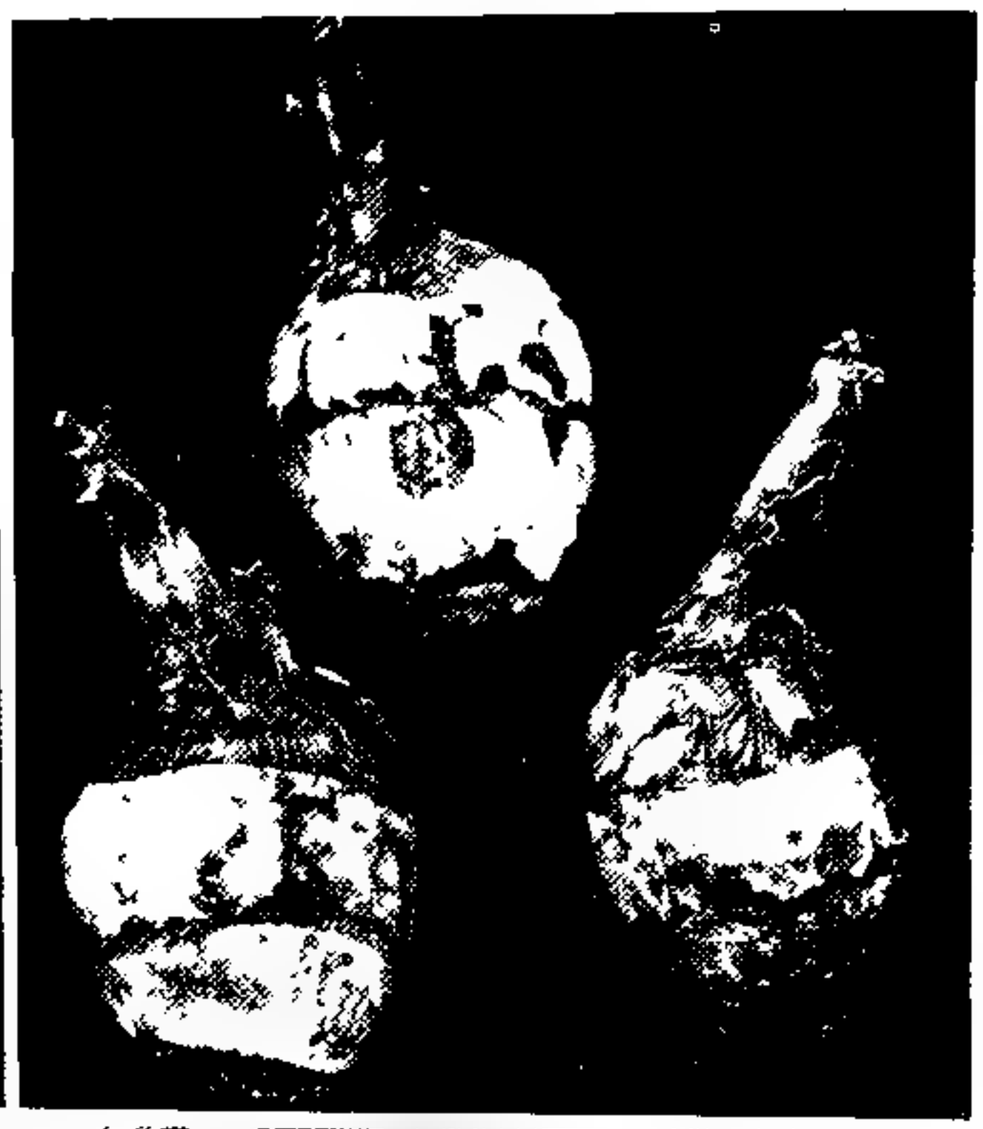
[1] Sims, J. Bot. Mag. *pl. 1631.* 1814. For convenience in this article, the Chinese arrowhead, which seems to be a broad-leaved form of the European species, is referred to as *Sagittaria sinensis.* It might better be regarded as a variety of *S. sagittifolia.*

[2] Blasdale, W. C. A description of some Chinese vegetable food materials. U.S.D.A. O.E.S. Bull. **68**:8. 1899.

[3] Bretschneider, E. History of European botanical discoveries in China, pp. 102 and 341. 1898.

[4] Wilson, E. H. A naturalist in Western China **II**:59. 1913.



Young plants of the Chinese arrowhead, their tubers below at the right. Above, tubers of the American species of Sagittaria

taro, *Colocasia.* At Foochow [5], where it is sometimes called arrow-grass, it is planted, like the taro, in the spring and the tubers are harvested in October. Each plant gives four to six tubers. The tender stalk is also occasionally used for food. In Japan the arrowhead is also cultivated.

The raw tuber of the arrowhead, which exudes a milky juice and has a potato-like appearance and consistency, serves as a source of starch. When boiled, it becomes sweet and acquires a farinaceous taste. A quantitative analysis [7] of the basic composition of the North American and Asiatic species gives the following percentages of the principal constituents:

	S. latifolia	*S. sinensis*
Water	66.8%	61.5%
Protein	4.4	7.0
Starch	19.6	22.9
Fat	1.0	1.0
Albuminoids	3.9	4.7

[5] Skvortzow, B. W. Notes on the agriculture, botany and zoology of China. Jour. N. Chin. Br. Roy. As. Soc. **51**:139. 1920.

[6] Tanaka, Y. Useful plants of Japan, pp. 26 and 27. 1895.

[7] See note 2 above.

The nitrogenous elements are (1) a soluble casein-like albuminoid, (2) a soluble albumen coagulating at 74° C., (3) a small amount of an unknown insoluble albuminoid, and (4) varying amounts of non-albuminoids of which asparagin is an important constituent.

The starch grains are round-oval, occasionally angled, and they seldom exceed 30 microns in diameter. They are eccentric, show striations clearly, and exhibit a slight play of colors through polarized light and a selenite plate.

The arrowhead tuber has many therapeutic uses.[8] Bruised leaves are applied to infected sores, snake and insect bites, and as a powder to itching diseases. The eating of raw tubers is said to be dangerous, producing fluxes and hemorrhoids and inducing premature birth.

An interesting note in regard to the leaf-shape of the arrowhead, which is the most distinctive thing about this plant, has been contributed by W. Wachter [9], who correlates root growth to leaf expansion. The first leaves are always narrow ovate-lanceolate and each succeeding one is broader until sagittate lobes are developed and the leaf reaches its mature dimensions. Keeping the roots trimmed back when the plant is young checks leaf expansion so that the leaves do not become sagittate. Trimming the roots after the plant has started to produce sagittate leaves, however, has no effect; in other words, sagittate leaves continue to be produced, only they are smaller.

The seed of *Sagittaria sinensis* has not been described. The flowers are borne in whorls clustered about a scape that comes up directly from the rootstock. The flowers are imperfect and dichogamy is highly advanced. Monoecious and dioecious forms occur. Double-flowered forms, which make an attractive display, have been described and figured as *S. japonica* Hort.[10] and as *S. japonica flore-pleno* Hort.[11]

The latter is [12] supposed to have originated in the botanical gardens in Madrid and from there was distributed by Haage and Schmidt, who introduced them into the trade. It is a double form of *S. sagittifolia* but is not winter-hardy.

Propagation is by tubers and is so prolific that compact masses of these plants will spread over wide swampy areas unless uprooted periodically. The projecting sprout develops a terminal bud from which roots and leaves emerge to form an independent plant. This in turn develops runners at the ends of which new plants appear. The axillary buds on the old tuber may produce new shoots that will develop a new plant system or may decay, leaving its offspring independent.

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[8] Stuart, G. A. Chinese material medica. p. 389. 1928.

[9] Wachter, W. Beitrage zur Kenntnis einiger Wasserpflanzen. Sagittaria chinensis Sims. Flora **83**:377. 1897.

[10] Gardener's Chronicle III. **30**:170-171. *fig. 54.* 1901.

[11] The Garden **74**:67. 1910.

[12] Schneider, C. K. Wasserpflanzen. Die Gartenmelt **III**:620-621. 1899.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

A Leading Botanical Text In a New Edition

BOTANY—A TEXT BOOK FOR COLLEGE AND UNIVERSITY STUDENTS. William J. Robbins and Harold W. Rickett. Third edition. 658 pages, illustrated and indexed. Van Nostrand, New York, 1939. $3.75.

When one compares the text books in elementary botany of today with those in use 25 years ago, one is impressed not only with their increase in number but by the high quality of so many of them. The reason why there are no more students in college courses in botany is not because of a lack of adequate and attractive presentation of the subject.

Among the group of leading American texts for many years has been the volume by Robbins and Rickett which now appears in its third edition. This is not radically different from the previous one in size and content but the reader will note a number of modifications and improvements. It is perhaps significant of the modern trend in botany that instead of beginning with a discussion of the cell, as before, the authors devote their first chapter to plant growth, thus emphasizing the chief visible activity of the plant. The more detailed aspects of growth, such as mitosis and meristematic activity, are necessarily discussed later under various organs. Structure is not neglected, for the treatment of the stem, where the basic facts of anatomy and histology are presented, now occupies 40 pages as against twenty in the last edition. The chapter on foods and nutrition is also twice as long and includes a discussion of new techniques in tank culture and the recent discoveries with regard to vitamins.

The treatment of plant groups, which constitutes the second section of the book, is much as before but with two changes. The chapter on Pteridophytes has now been divided into two, one on ferns and the other on horsetails and lycopods. The material dealing with Angiosperms has been rearranged and considerably increased. The first portion discusses gametophytes, floral homologies, and the various types of organs in these higher seed plants, with a description in many instances of the adaptations which they show. The formal description of groups, from Ranales to Orchidales, has been cut from 38 pages to 17. Discussion of plant evolution is somewhat revised but no mention is made of the large Devonian flora of primitive vascular plants, the discovery of which has had such an important influence on modern ideas of phylogeny. There are many new and excellent illustrations scattered through the text.

EDMUND W. SINNOTT,
Professor of Botany,
Columbia University.

Herbs—Their Ancient Lore And Modern Culture

MAGIC GARDENS. Rosetta E. Clarkson. 370 pages, illustrated. Macmillan, New York, 1939. $3.

If you would live forever, all you must do is to eat sage in May.

Alkanet, in the olden days, was the symbol of falsehood because they made lipstick from its roots, and of course no respectable woman would lie about the color of her lips.

Brides warded off husband trouble by inserting a few sprigs of rosemary in their bouquets at the time of marriage.

Tansy was reckoned as a cure for "freckles . . . hysterics . . . and sprains," and Dioscorides declared a concoction made from wormwood helped one through the remorseful stage of a binge.

In the language of herbs, basil stood both for hatred and love, nettle (quite properly) for slander, mint for wisdom; and if Hollywood wants an official flower it might select spiderwort because it has always represented transient love.

All this is but an appetizer to the metaphysical feast of herb lore to be found in Mrs. Clarkson's recently published Magic Gardens.

A chapter of singular interest discusses "Simples," that doctrine which taught an early people that God in His mercy stamped upon the herbs certain signs and signatures which indicated their particular usefulness in curing bodily ills. In addition, the book contains an extended discussion of herbs' ancient uses, the superstitions attending them, and descriptions of early gardens and their walls, walks and mazes, all of which is preparatory to a very scientific and modern treatment of the subject.

Even a cook-book is incorporated in Magic Gardens, with several recipes from the sixteenth and seventeenth centuries, besides several score of modern recipes requiring herbs, for the excellence of some of which this reviewer can personally vouch.

Mrs. Clarkson's book is a valuable addition to our constantly increasing library of herbals. If the reader lacks interest in the legendary and speculative phases of the subject, he still has a most practical guide for frequent reference as he plans and cultivates his herb garden.

So far as this grower is concerned he has never failed to find the answer in something Mrs. Clarkson has written.

EDGAR R. MCGREGOR,
Wheeling, W. Va.

An Up-to-Date Guide To Propagation

PROPAGATION OF HORTICULTURAL PLANTS. Guy W. Adriance and Fred R. Brison. 314 pages, illustrated with photographs, indexed. McGraw-Hill, New York, 1939. $3.

Here is a good practical guide to those interested in general horticulture and a book of considerable value to the student of agriculture.

The subject matter includes all the well known methods of propagation of plants. Chapters are presented on seeds and seedlings, bulbs, layering, grafting, budding, making cuttings, and transplanting.

Perhaps the chief reason for another book on practical plant propagation is the fact that the more recent modifications of standard practices are included from the fields of research. Such items as vernalization, hormone treatments to induce rooting of cuttings, and special treatments for insect pests are described and evaluated as a help to the practical man.

Study questions at the close of each chapter and a short bibliography help to make the book of value as a text. The illustrations are numerous and well done.

E. E. NAYLOR,
University of Missouri.

The Mechanism of Reproduction

THE EVOLUTION OF GENETIC SYSTEMS. C. D. Darlington. 149 pages, illustrated and indexed. Macmillan, New York, 1939. $2.75.

In The Evolution of Genetic Systems, C. D. Darlington discusses from a cytological point of view the principles of heredity, the processes involved in reproduction, and the underlying mechanisms which influence heredity and variation.

There are 21 chapters which deal with the following topics: Premises of Genetics; The Substance of Heredity; Sexual Reproduction; Meiosis: Pairing and Crossing-over; Meiosis: The Process of Assortment; Change of Quantity: Polyploidy; Change of Position; Hybrids: Diploid and Polyploid; Change of Proportion; The Atom of Genetics; Chromosome Mechanics; Genotypic Control; The Mechanism of Crossing-over; The Biology of Recombination; The Pursuit of Hybridity; The Permanent Hybrid; The Evolution of Sex; Sterility: The Contradiction; Apomixis: The Escape; The Integration of the Cell; and The Evolution of Heredity.

The author has attempted to separate the facts concerning the cytology of reproduction from the theories, which permits the student in genetics and cytology to grasp quite readily a general view of the mechanical processes involved in reproduction.

CLYDE CHANDLER.

Chemical Dictionary

STANDARD CHEMICAL AND TECHNICAL DICTIONARY. H. Bennett. 638 pages. Chemical Publishing Co., New York, 1939. $10.

Much of the chemical part of this dictionary is in the usual handbooks. The particular value of the book lies in the explanation of chemical and technical terms and trade names used in industry. The sections on Nomenclature of Organic Chemistry, Prefix Names of Organic Radicals, and Pronunciation of Chemical Words will be found useful by all who read organic or biochemistry.

FREDERICK W. KAVANAGH.

Current Literature At a Glance*

By Virgene Kavanagh

Nucleic Acids. Plants and animals, as we see them every day, look so different that we seldom stop to realize that they are fundamentally so similar that no one knows why they are not all alike and that animal-plants claimed or disclaimed by both botanists and zoologists exist. A few years ago biochemists thought they had found a real difference between plants and animals in the structure of their nucleic acids. These acids occur in the nucleus of each cell of every plant and every animal and are apparently associated with the genes, the factors in heredity. Early analyses showed that the nucleic acid of animals contained a sugar and an organic base different from the nucleic acid of yeasts, which are plants. In 1937 and 1938 biochemists secured a nucleic acid from wheat which was like that from animals. This might mean then that green plants and animals were more alike than green plants and yeasts. However, Miss Delaporte, a French cytologist, has been able to obtain two kinds of nucleic acid from yeasts; the one in the nucleus is like that of the animals and the green plants; the other nucleic acid occurs outside the nucleus. So biochemists must look again for the thing that makes a plant different from an animal—B. Delaporte, *Rev. Gén. de Botanique,* Aug. 1939.

Forest Products. Most of us know that forest products are essential to us, but we seldom stop to realize in just how many ways. One recent survey listed 4,500 uses and still did not exhaust the possibilities. Once wood was used chiefly in the form of lumber, shingles, and cordwood or logs. These forms are still used as building materials, railroad ties, telephone and telegraph poles, fence-posts, river and dock pilings, mine timbers, and fuels. Now, it is told in a booklet, "Products of American Forests," issued last August by the Forest Products Laboratory of the U.S.D.A. Forest Service, veneers, plywoods, pressed woods, wood pulp, wood flour, and wood compound solutions are used in house construction, furniture, interior decorating, paper, rayon, linoleum, and plastics. In the *Queen Mary* more than a million square feet of plywood and at least 56 different kinds of wood were used. Resins, turpentine, oils, tannins, some dye-stuffs, and several pharmaceuticals are among the world's forest products. In this country, nuts, fruits, maple sugar, and vinegar come from trees; abroad, sugar and stock feeds are being made from wood. The Christmas tree and decoration business in the United States, which is dependent on forests, amounts to several million dollars a year.

New York Fruits. The January number of *Farm Research,* published by the Agricultural Experiment Station at Geneva, N. Y., reports that four new varieties of cherries tested in New York State—***Seneca, Lyons, Emperor Francis,*** and ***Victor***—have given good yields of satisfactory fruit.

The ***Geneva Delicata*** squash is described in this issue as mosaic-resistant and as being well liked by the people who have co-operated in testing it. Seeds may be obtained either from certain commercial dealers or, for 25 cents this year, from the Experiment Station.

Delphinum Culture. If your delphiniums do not grow as well as you think they should or if diseases kill them, Farmers' Bulletin No. 1827 of the U. S. D. A. may be of use to you. F. L. Mulford and F. Weiss prescribe a fairly rich, deep, well-drained, almost neutral soil for the delphiniums. Seeds planted in the spring give better results in the United States than do the vegetative propagations. The perennial plants may be started in the late summer or transplanted then if they were sown in the spring. Of the perennial species, most varieties of *Delphinium grandiflorum, D. hybridum, D. exaltatum, D. fissum,* and *D. formosum* are apt to grow well. Diseases of delphiniums include root-rot, bacterial leaf-spot, mildew, blight, stunt, and mosaic. The perennial plants should be mulched with manure or compost and the withered flowering stalks should be removed.

Lightning. Over a three-year period, 53 members of the National Shade Tree Conference have reported lightning injury of 140 trees. The report has been issued as a reprint from the Fifteenth National Shade Tree Conference Proceedings, 1939.

* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

Oak, elm, pine, ash, yellow poplar, and maple have been shown to be most susceptible, especially those standing alone or in small groups, and reaching a height of from 50 to 70 feet.

Papers. Recent publications by members of the staff at the New York Botanical Garden have included: "The Genus *Clidemia* in Mexico and Central America" by H. A. Gleason and "The Flora of Mount Auyan-Tepui, Venezuela" by H. A. Gleason with E. P. Killip, both in *Brittonia,* Oct. 1939; "Growth substances and gametic reproduction by *Phycomyces*" by W. J. Robbins in the *Botanical Gazette* for December; and "Growth substances in agar" by W. J. Robbins in the *American Journal of Botany* for December. Another article in the current number of *Brittonia* is "The American species of *Erythrina*" by B. A. Krukoff.

Lethals. Dr. B. O. Dodge has an article in the November *Journal of Heredity* on "A new dominant lethal in *Neurospora.*" This is the third lethal gene which Dr. Dodge has described in *Neurospora tetrasperma,* one of the pink bread molds. This *Neurospora* usually forms four-spored fruiting bodies, called asci; but when it carries the new lethal gene, most of the asci contain no spores though a few of them contain eight, but never four. However, when the eight spores were placed on a medium on which the species would usually grow, only four of the eight germinated. When the molds from these eight-spored asci were mated, four-spored asci developed. The culture medium affects the degree of dominance of this gene: on some media all the asci abort; on other media most of the asci may develop spores.

Notes, News, and Comment

Annual Meeting. All officers of the New York Botanical Garden were re-elected at the annual meeting which took place on January 8. Joseph R. Swan thus continues as President of the Garden; Henry de Forest Baldwin and John L. Merrill, Vice-presidents, and Arthur M. Anderson, Treasurer. The two Assistant Directors of the Garden, Henry de la Montagne and H. A. Gleason, were re-elected as Secretary and Assistant Secretary of the Board.

New members of the Corporation who were elected the same day are Dr. A. Percy Saunders, who became a member of the Board in November; Rutherford Platt of Platt-Forbes & Co., New York; Mrs. Roswell Miller, Sr., of the Advisory Council; Edgar B. Stern of New Orleans; Louis E. McFadden of Peekskill, N. Y.; and H. R. Kunhardt, Jr., of New York and Venezuela.

The following committees were chosen for the year: Executive Committee: Henry de Forest Baldwin, R. A. Harper, Edmund W. Sinnott (alternate), Pierre Jay, Allyn R. Jennings, Clarence McK. Lewis, William J. Robbins; Finance Committee: Pierre Jay, H. Hobart Porter; Scientific Committee: Clarence McK. Lewis, Elmer D. Merrill, Franklin F. Hopper, Charles Russell, Herman A. Spoehr; City Relations Committee: Henry de Forest Baldwin.

Advisory Council. Mrs. Elon Huntington Hooker, in giving the annual report of the Advisory Council at the annual meeting of the New York Botanical Garden, announced that the council had a committee ready and waiting to equip a members' room in the administration building, "where all members of the Garden would feel at home." (A special room for members on the third floor is one of the immediate plans of the Botanical Garden, and it is hoped that it can be completed during the present year.)

The executive committee of the Advisory Council now consists of Mrs. James Barnes, Mrs. Robert H. Fife, Mrs. Henry J. Fisher, Mrs. Henry St. Clair Putnam, Mrs. Henry F. Schwarz, and Mrs. Antonie P. Voislawsky. The officers continue as in the previous year: Mrs. Elon Huntington Hooker, Chairman; Mrs. Carl A. de Gersdorff, Vice-chairman; Mrs. William A. Lockwood, Second Vice-chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; Mrs. F. Leonard Kellogg, Treasurer.

Torrey Club. Dr. B. O. Dodge was elected President of the Torrey Botanical Club for 1940 at the annual banquet and meeting the night of January 10 at the Faculty Club at Columbia University. Miss Clyde Chandler was re-elected Recording Secretary and Dr. H. N. Moldenke, Treasurer. Dr. W. J. Robbins continues as a member of the Council of the Torrey Club, and Dr. J. H. Barnhart is representative of the club on the Coun-

cil of the American Association for the Advancement of Science. Dr. H. W. Rickett has been elected Editor of the Bulletin of the Torrey Botanical Club, and Mrs. L. D. Schwarten, Assistant Librarian at the Garden, has been elected Bibliographer. Dr. J. S. Karling of Columbia University is Corresponding Secretary. Dr. John A. Small of New Jersey College for Women heads the Field Committee for the year and Dr. H. K. Svenson of the Brooklyn Botanic Garden, the Local Flora Committee.

Winter Woods. Rutherford Platt, newly elected member of the Corporation of the Garden, is showing natural color slides of "Color in the Winter Woods" at the McMillan Theatre, Columbia University, March 6, at 4 p.m. The program is open to the public.

A.A.A.S. Dr. William J. Robbins has been elected Section Committeeman of the American Association for the Advancement of Science for the Section on Botanical Sciences (G), for the period ending at the close of the annual meeting in December 1943.

Lectures. P. J. McKenna addressed the general assembly at Hunter College January 10, on "Conservation." Elizabeth C. Hall spoke on "Fireside Gardening" over radio station WOR on January 15, on the program of the Radio Garden Club. A. C. Pfander, substituting for T. H. Everett, spoke before the Montclair Garden Club on January 15 on the subject of "Shady Gardens."

Palm Flowers. Among the many palms which came into bloom the early part of the year in the central dome of the main conservatories, were two specimens of *Livistona cochinchinensis* which flowered for the first time since they arrived at the Garden in 1901 and 1902. They were brought in during the early days of the conservatory as small tub plants, one of them a gift from a wife of a member of the Garden. Today, they stand between 30 and 40 feet tall, bearing their long loose clusters of fluffy, yellow flowers near the base of the leaves at the top. Although this species of palm, which comes from Malaya, is a close relative of the common Chinese fan or fountain palm (*Livistona chinensis*), it is seldom found in cultivation in this country.

Explorer. L. S. Taylor of Victoria, B. C., who has spent many months exploring and plant collecting in South Africa, spent the day of Jan. 25 at the Botanical Garden, chiefly inspecting the collection of Old World succulents, the majority of which have come from South Africa. That evening Mr. Taylor spoke before the Horticultural Society of New York, describing his expedition.

Student Gardener. Donald Samson, who recently returned from Edinburgh, where he had expected to spend a year as exchange student gardener at the Royal Botanic Garden there, began a new position Feb. 1 as gardener and propagator at the University of North Carolina under Dr. W. C. Coker.

Outdoor Clubs. Twenty members of the Appalachian Mountain Club visited the main conservatories Jan. 20, and 15 members of the Watchung Nature Club of Plainfield, N. J., were shown through the laboratories, herbarium, library, and the main conservatories Jan. 28.

Calendar. A picture of the Elgin Botanic Garden, which stood on the present site of Rockefeller Center more than a century and a quarter ago, appears on the 1940 calendar of the East River Savings Bank, a copy of which hangs in the garden's library. The picture, which is in color, closely resembles an oil painting which also hangs on the library's walls. The explanation reads: "Before our bank was founded in 1848 in lower New York, the famous Elgin Botanic Garden stood where one of our branches now serves Rockefeller Center." The Elgin Garden was the historical predecessor of the New York Botanical Garden in the life of New York City.

Information on the Elgin Botanic Garden is scarce today, but there are, in addition to the oil painting at the New York Botanical Garden, two pictures, one at the New York Public Library on Fifth Avenue and the other in Valentine's Manual. These two have been combined in creating the picture which was used for the calendar of the East River Savings Bank, and additional information for it was obtained by consultation of such material as Simond's Medical Repository (1810), Reinagle's Catalogus Elginensis for the American Medical and Philosophical Register (1814), and the Magazine of American History (1886).

THE NEW YORK BOTANICAL GARDEN

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PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures, covering the algae, fungi, mosses, ferns, and flowering plants. 1918. $3.50.

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Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each, $5 a volume. In the fourteenth volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Prices to members of the Garden: Vols. 1-6, $1.50 each; to others, $3. Vol. 7, $2.50 to members; to others, $5. *Contents*: Vol. 1, PER AXEL RYDBERG, An Annotated Catalogue of the Flora of Montana and the Yellowstone Park. Vol. 2, D. T. MACDOUGAL, The Influence of Light and Darkness upon Growth and Development. Vol. 3, ARTHUR HOLLICK and E. C JEFFREY Studies of Cretaceous Coniferous Remains from Kreischerville, N. Y. Vol. 4, C. STUART GAGER, Effects of the Rays of Radium on Plants. Vol. 5, NORMAN TAYLOR, Flora of the Vicinity of New York. Vol. 6, Twentieth Anniversary of The New York Botanical Garden. Vol. 7, N. L. GARDNER, New Myxophyceae from Porto Rico; A. B. STOUT, The Flower Behavior of Avocados; H. H. RUSBY, Plants Collected in the Amazon Valley; ARTHUR HOLLICK, The Flora of the Saint Eugene Silts.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

March 1940

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EDUCATIONAL PROGRAM OF THE NEW YORK BOTANICAL GARDEN 1940-1942 — Supplement

ENRICHMENT OF GARDENS

Visitors to the International Flower Show in New York this month will find, in the New York Botanical Garden's exhibit, what is probably the largest collection of hardy ferns that has ever been assembled for an indoor display. Only a comparatively few of these ferns are known in American gardens, yet all of them have been found hardy in similar climates. A list of them is printed here, and the Garden is prepared to tell growers where the unfamiliar ones are obtainable.

This is an example of how American gardens can be enriched through the work of institutions like the Botanical Garden, and also through a great yearly event like the International Flower Show.

Those who visit the Garden and study the displays and collections there totaling many thousands of fine plants will appreciate further the contribution that the Garden is making to horticulture as well as to the pleasure of the public.

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The Life Story Of A Fern

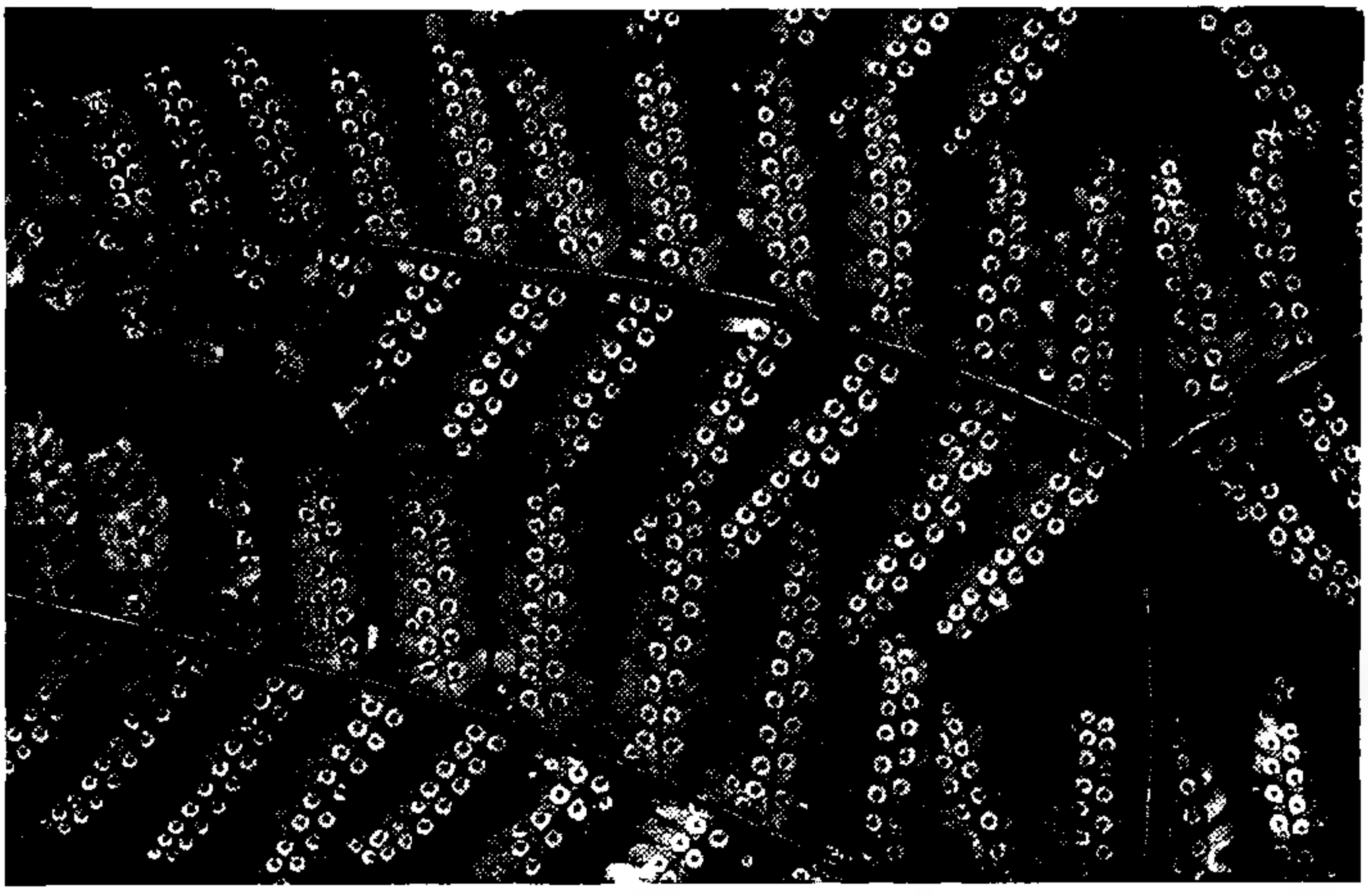
How The Plant Behaves Through Two Alternating Phases Of Existence

By H. W. Rickett

FEW persons other than botanists with microscopes have ever seen the individual spores of ferns. So unfamiliar are they that many weird legends were built up around these "seeds" in the past. Their magical properties, it was told, might even render their lucky owner invisible; he assuredly never thought of using them to raise new ferns. Yet this is the sole function of the dust-like particles that are scattered almost invisibly into the air from the leaves. Actually a fern has no true flowers, fruits, or seeds. These minute spores are its reproductive bodies.

In temperate countries ferns are composed mainly of green leaves, often large and divided into hundreds of segments; they grow from small stems at or beneath the surface of the ground. Some have a short thick stem more or less erect in the soil but never projecting much above it. The stem of other kinds is slender and it extends horizontally. As it grows at the tip the opposite end may die, so that the whole fern creeps, so to speak, through the soil. A creeping stem may fork, the two branches diverging and eventually becoming separated by the death of the older parts. The result is comparable to the natural production of new strawberry plants by runners.

The leaves of many ferns have similar methods of propagation. One kind has leaves that taper to a fine point, which forms a new plant when it touches the ground. Other kinds form minute buds on their leaves; these fall to the ground and continue growth independently of the parent. A few form new plants on their roots. All these are considered methods of vegetative propagation, not strictly comparable to the formation of new plants from seed.

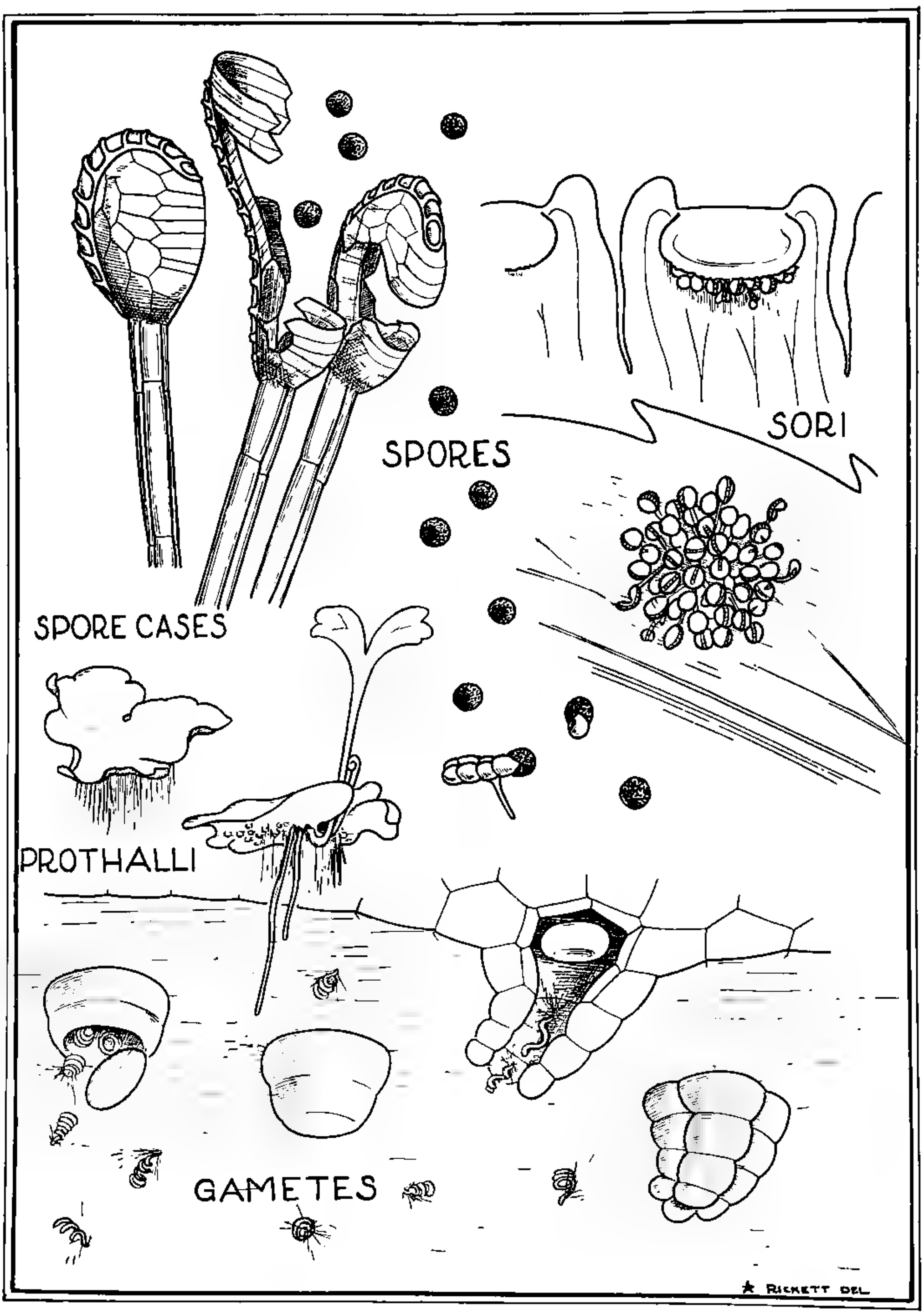


The fruit-dots, or sori, on the back of the pinnules of a portion of Dryopteris Filix-mas. Each is covered by a stalked scale.

Ferns do, however, reproduce also in a less casual and more specialized manner that may be likened to the production of flowers by a flowering plant or cones by a conifer. If you examine a leaf, or frond, as it is often called, well along in the growing season, you will probably find on the lower side of some of its segments small brown or orange spots, rough or scale-like in appearance, usually fairly uniform in size, shape, and arrangement. These are the normal reproductive structures formed by the leaves, filling the place of flowers in the fern's economy. They are commonly known as fruit-dots, or, more technically, *sori* (singular, *sorus*).

To penetrate the secrets of the life cycle of a fern, it is necessary to use a microscope. If you use a hand lens on a sorus, you may be able to see that it is composed of several hundred globular brownish bodies attached to slender stalks that project from the under surface of the leaf. These are spore-cases, which in many ferns are concealed beneath a small and characteristic scale which grows over them from one side or which protects them like a minute umbrella or which almost completely encloses them like a sack. So characteristic are the size, shape, arrangement, and covering of the sori that they are much used in classifying and identifying ferns.

Several spore-cases may easily be removed from a sorus with a dissecting needle and studied with a more powerful microscope. Those that appear opaque obviously contain some fairly solid matter. Beginning near the



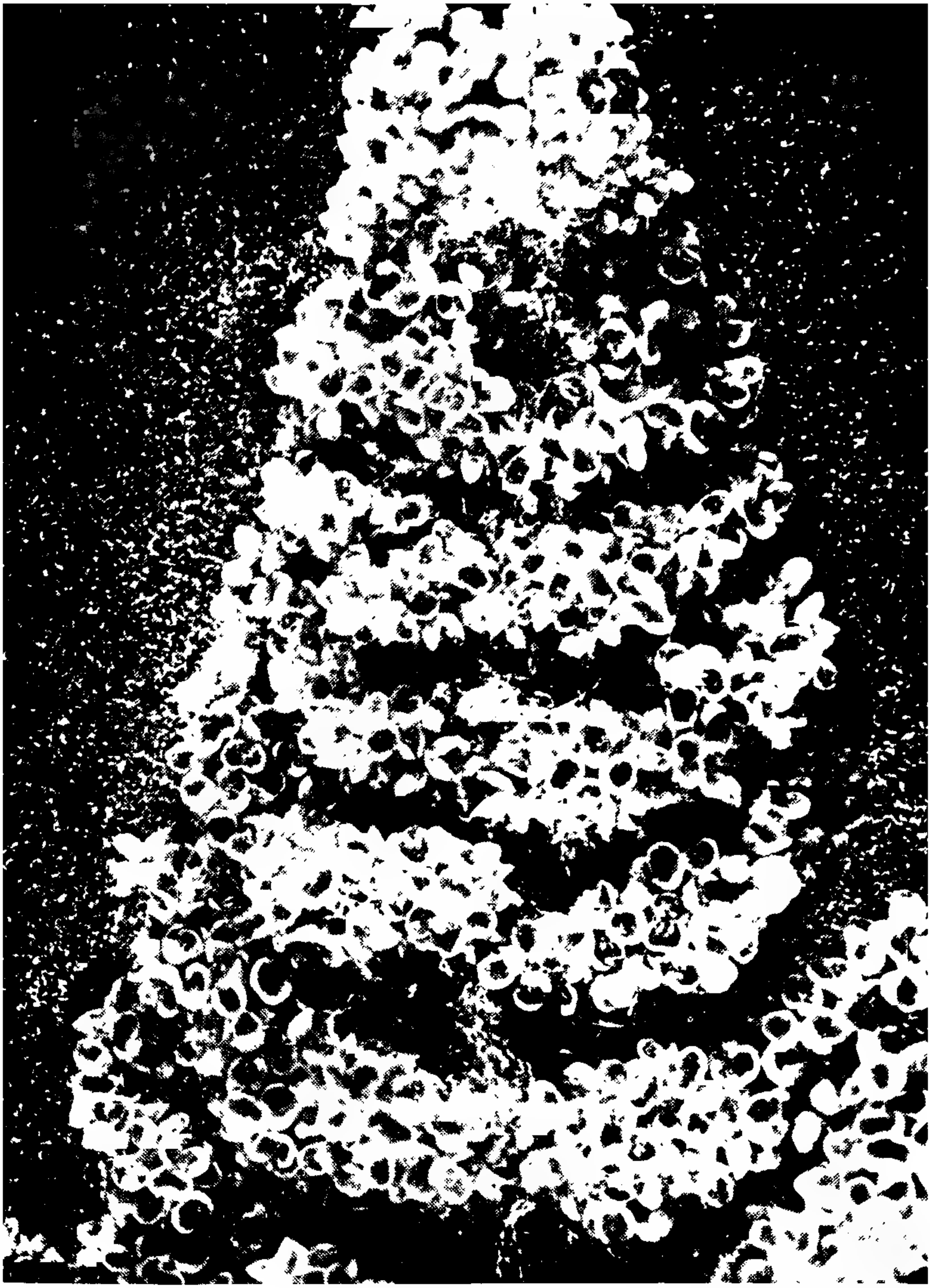
The life story of a fern, from the sori on the leaves to the first small fronds of a plant which is actually two generations removed, the intervening generation showing in the prothalli with the greatly enlarged drawing of their gametes.

point where the stalk is attached to the spore-case and extending up the side and over the top is a raised ridge something like the crest on an ancient helmet, golden-yellow or orange in color. When mature this crest dries, and as it dries it straightens, tearing apart the walls of the sack to which it is attached and spilling into the air a number of minut particles which were within. These are the spores. After a while the crest may curl again to its former shape, often so violently as to throw out any remaining spores that may adhere to the torn walls of the spore-case. The empty spore-case remains attached to the leaf and appears transparent.

The spores, dust-like particles set free in the air about a fern frond, are distinguished from true seeds by their small size and by their lack of differentiated parts. No embryo plant may be found within a spore. Each, however, bears the living matter that can eventually grow into a fern plant with its characteristic parts. A fern leaf may produce several millions of these bodies, each potentially a new fern. They float easily in the air and are dispersed by the slightest breeze. If all were to live and grow we should soon be fighting our way through a jungle reminiscent of the vegetation of the earth millions of years ago. Since the surface of the globe is already well occupied, most of the spores must die. Their chance of survival depends on finding a vacant millimeter or so of moist soil or rock crevice where the temperature is moderate and the sun's rays do not strike. In such a fern Utopia the spore rapidly enlarges and begins to take on the characters of a mature fern plant.

At this point the observer meets his greatest surprise. The new plant that develops from a spore is surely a fern, since its parent was a fern; but it does not look like one. Even when mature it has no leaves, no stems or roots. It is a small, delicate, dark green object, resembling most a minute and rather formless leaf with crinkled edges. It may, with luck, live for several years, and, if carefully cultivated by a well-disposed botanist, may attain a diameter of an inch or two; but that is all. It never attains anything that the ordinary observer would think of as fernhood. To distinguish it from its more imposing parent it is known as a *prothallus* (or *prothallium*). Under certain conditions it may become heart-shaped or even butterfly-shaped; if crowded, as it usually is, it is likely to be irregular. It may lie flat on its substratum, anchored by minute white hairs which grow from its under side. Or, if it grows in a cave where light enters only from one side, it may stand nearly erect on one edge, facing the light. Prothalli are not easily found in nature, but occasionally carpet a moist ledge or the floor of a cave with a dark green moss-like growth.

As they differ from the parent plant in size and shape, so they differ also in their manner of creating a new generation. On the lower surface of the prothallus, projecting into the film of water that separates it from



Photograph by Rutherford Plat

Cinnamon fern throwing its spores, taken under high magnification. The spore-cases of this fern lack the crest which is characteristic of most other species, opening instead across the top. This picture represents little more than half an inch at the tip of the frond which bears the spores.

the substratum, are two kinds of reproductive structures. One kind is dome-shaped. At maturity a lid opens and through the opening many minute objects are expelled into the film of water. Each of these is shaped like a coiled spring. Near one end are attached many extremely delicate hairs which vibrate and lash the surrounding fluid, thus imparting to the coiled body a characteristic rapid, tumbling motion. When observed in a microscope a prothallus may be seen to be surrounded by a swarm of these tiny swimming creatures, resembling water insects rather than anything related to a fern. They are named *gametes.*

The other reproductive structure is a sort of flask with an open neck that projects downward into the water. Of the thousands of swimming gametes that may be present near the prothallus, a few may chance to pass near the mouth of one of these flasks; these respond to some substance emitted from its interior, swim towards it, and enter the opening. At the base of the neck is a chamber which contains a single gamete of a different sort—a comparatively large and immobile body. When one of the swimming gametes reaches this, the two unite and become what is called a *zygote.* This is the beginning of a new fern plant, a living structure capable of growth to maturity and soon recognizable as a fern of the familiar type. The prothallus has thus produced a new generation, not by spores, not in any way that recalls the manner of reproduction of its parent, but in a highly intricate and specialized manner of its own.

Several weeks after the union of the gametes the student may observe a tiny hair-like root extending from the prothallus into the substratum. This is not a root of the prothallus, which never has one, but belongs to the new plant; it is one of the first visible results of the growth of the zygote. Soon afterwards a small leaf uncoils from the same spot; then another, a series of them, each a little larger than its predecessor, each a little more like a characteristic fern frond. Finally, after many months, a stem begins its slow and inconspicuous advance into the soil, and develops its crown of fronds. The prothallus withers and dies, having produced its single offspring. A new fern has been formed, a fern like that with which we began this history.

To sum up this remarkable series of events, a fern is not one kind of plant but two. The more familiar plant is known to botanists as the spore-forming plant, or *sporophyte.* Any spore that it forms is capable of growing into an inconspicuous gamete-bearing prothallus, known as the *gametophyte.* This in turn through the activity of its gametes gives rise to a new sporophyte. The two types of fern alternate in the life cycle. Parent and offspring differ in size, structure, and method of reproduction. Heredity in ferns means that the characters of the parent are never exhibited by the immediate offspring!

This very elaboration of the life cycle has been a factor in the downfall of the ferns and the rise of the flowering plants. For one prothallus mil-

lions of spores are formed and scattered by the wind to fall mostly in places unfit for their development. The prothallus is a fragile thing, easily destroyed by even temporary drought. To form one zygote hundreds of swimming gametes must be released from their domes, for most of them fail to find the other kind of gamete. Finally the zygote must slowly grow from its small beginning, exposed from the first to dangerous variations in temperature, light, and moisture.

The flowering plant compresses all this sequence into the formation of its seeds, concealed within the fruits. When the seed is liberated, a small plant, carefully wrapped and well rationed with reserve food, is already formed and ready to continue its growth at a moment's notice. It is small wonder that growers of ferns are only occasionally concerned with spores, prothallus, and gametes, but rely more often on the separation of the underground stems and other methods of vegetative propagation.

Notes On The Cultivation Of Hardy Native Ferns

By Isaac Langley Williams *

WITH the coming of spring there arises the annual problem of planning the garden. This means collecting and reading many plant and seed catalogs, and making lists. Regardless of the carefully listed selections, and the infinite care in planting, there always seems to be at least one shady spot where "nothing will grow." As a result, growers are always suggesting material which they think will readily adapt itself to any location. Instead of planting more perennials and annuals which hitherto have proved unsatisfactory, some of the hardy, native ferns might prove worth a trial. For nearly every kind of soil — unless it is hard baked clay — and for nearly every sort of location there are ferns which will thrive and become a desirable addition to a planting.

Ferns have characteristics of their own that one must consider. Of course, soil conditions and planting locations are the two most important factors in growing hardy ferns. Contrary to the ideas of many gardeners, any fern will not grow in any spot where one just happens to want to plant something, but any fern will grow where it feels at home. This means reproducing soil and shade conditions as similar as possible to those provided by nature. An ideal soil for ferns is one made up mainly of leafmold. Many gardeners believe in using large quantities of fertilizers in their perennial or annual borders. Consequently they often ask if natural or commercial fertilizers are good for ferns. The answer is

* Mr. Williams, who has long been a specialist in the culture of native eastern wild flowers and ferns, has contributed more than 500 ferns which the Garden has forced for its 1940 display at the International Flower Show.

emphatically *no*. The best fertilizer to use for ferns is the rotted leaves which have been used as a winter mulch and left for the ferns to grow in.

Now for the ferns themselves. The large number of species offer wide and varied selections, but I shall confine myself to those species native to the cooler sections of the country.

Species from the Northern Woods

Let us begin with the Maidenhair Fern, *Adiantum pedatum*. This fern has large feathery fronds on wiry black stems. In the spring it has a pleasing reddish color. As the weather grows warmer the stems darken and the fronds turn to a beautiful shade of green. This species is one of the most delightful. It likes a soil with plenty of leafmold and one with a neutral reaction.

Ebony Spleenwort, *Asplenium platyneuron*, is a low-growing evergreen fern. It is ideal for the half-shady rockery. Natively it grows in crevices and soil-pockets among the rocks.

Maidenhair Spleenwort, *Asplenium Trichomanes*, is to me the daintiest of all the ferns. It stands from four to six inches high and is evergreen. Although it grows naturally on limestone cliffs, the actual leafmold in which it grows is acid. Propagation is by division and by spores.

Narrowleaf Spleenwort, *Athyrium angustifolium* [1] is a very distinctive species, which often attains a height of three feet. The fronds are vigorous and of a rich green color. It prefers rich woods and is deciduous.

Walking Fern, *Camptosorus rhizophyllus*, is an interesting species, for the fronds, from four to ten inches high, taper at the tips and there they root when, on bending over, they touch the soil. It grows on limestone cliffs, therefore it makes a suitable rock-garden variety. It is evergreen and requires heavy shade in our beds.

Berry Bladder Fern, *Cystopteris bulbifera*, is a slender graceful deciduous species preferring a moist location, such as a shaded brookside. On the under sides of the fronds small green "berries" appear. It is very effective when growing in masses on a moist bank or ledge.

Clinton's Wood Fern, *Dryopteris Clintoniana*, is a large, evergreen fern, which should be seen to be appreciated. It grows naturally on the hummocks in our alder swamps, along with its close relative, the Crested Wood Fern, *Dryopteris cristata*.

Winged Wood Fern, *Dryopteris hexagonoptera*, is one of the rarer ferns in the vicinity of Exeter, but it is easily propagated by division of its running stems. It is a deciduous fern that is at home on the banks of a small brook. It seems particularly to like the silt deposited when the brook is in flood.

Oak Fern, *Dryopteris Linnaeana*, grows from four to ten inches high. It is a tiny graceful species with triangular fronds on black wiry stems. It likes plenty of leafmold on a moist shady bank.

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[1] Also frequently known as *A. pycnocarpon*.

Male Fern, *Dryopteris Filix-mas,* grows in deep woods soil on some New England mountains. It is one of the rarest of ferns; almost evergreen and resembles the much more common *Dryopteris marginalis.*

Goldie's Fern, *Dryopteris Goldiana,* is the largest of all the so-called wood ferns. It grows naturally in the deep woods soil in our mountain ravines. But in cultivation it will grow in any leafmold soil and even in the rather dry soil under our native white pines. The fronds have a color all their own, in deep shade possessing a distinctive blue tint, but in a less shaded location assuming a golden green color.

Leather Wood Fern, *Dryopteris marginalis,* is an evergreen fern found growing among the rocky woods. It is one of the first to reclaim an abandoned cellar hole, growing under the shade of a sumac in the old foundation stones.

Toothed or Spinulose Wood Fern, *Dryopteris spinulosa,* is the evergreen fern used by florists and called "fancy fern." It is equally at home in the rocky hillside woods or under pine trees.

Common Polypody, *Polypodium virginianum*[2], is the "rock fern" of my childhood. This evergreen species grows in mats on rocks. It doesn't seem to require much soil or moisture in nature but to transplant successfully one must be sure that the roots are pressed firmly into the soil and that it is watered generously until it becomes established.

Christmas Fern, *Polystichum acrostichoides,* is a twelve- to eighteen-inch evergreen fern that likes to grow on a hillside. There is one spot here in southern New Hampshire where it is massed on the northeast side of a hill with dogwood and witch hazel for shade. It grows anywhere in a leafmold soil where there is plenty of shade.

Braun's Hollyfern, *Polystichum Braunii,* is a distinctive species that grows on the higher mountains of New England. It grows naturally in a rocky shaded ravine where there is plenty of leafmold and moisture. It is one of the rarer species.

Common Woodsia, *Woodsia obtusa,* is one of the low-growing ferns suitable for the shady rockery. It is a deciduous species that grows on hillsides.

Hartstongue Fern, *Phyllitis Scolopendrium*[3], is one of the rarest species in this country, but recently it has been grown from spores and by cultivation it has probably been saved from extinction. There are numerous forms of this species under cultivation. It is very distinct, in that it does not resemble in any way any of the other native ferns. The fronds are entire without visible serrations. In fact, the fronds resemble lengths of

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[2] The eastern American species was formerly combined with the Eurasian species, *P. vulgare,* but is now held to be distinct.

[3] Formerly known as *Scolopendrium vulgare.*

Photograph by Margaret McKenny

The walking fern, which produces new plants when the elongated tips of the leaves bend over to the soil and take root. The small roundish fronds of a young plant may be seen in the foreground.

deep rich green ribbon. The short stems and midribs are dark greenish brown. This species I consider one of the choicest for the fern lover to possess.

Lady Fern, *Athyrium Filix-femina,* a deciduous species, makes itself at home almost anywhere in partial shade such as the north side of a stone wall in an open field. It also delights to grow on our moist roadsides and in pine woods. This fern will grow in a great variety of locations.

Fragile Bladder Fern, *Cystopteris fragilis,* is a small deciduous fern that grows on rocky hillsides or on ledges. It is ideal for the partly shaded rock garden.

Hayscented Fern, *Dennstaedtia punctilobula,* comes by its name honestly as the crushed fronds smell like new-mown hay. The two-foot fronds are graceful and feathery and form dense mats, as this species spreads from the roots. Once established it will grow in the open sun here in northern New England, but does equally well in shade. It is easily propagated by division of its running roots.

New York Fern, *Dryopteris noveboracensis,* is a deciduous fern similar to the Hayscented Fern but smaller. It will succeed in partial shade. It too grows in dense mats.

The Osmundas form a group by themselves. They are the Cinnamon Fern, *Osmunda cinnamomea;* Interrupted Fern, *Osmunda Claytoniana;* and the Royal Fern, *Osmunda regalis.* All are deciduous and grow two to four feet in height. They are the tall-growing ferns often seen by the roadside. The Cinnamon Fern likes more shade than the other two although the Royal Fern will also grow in rather dense shade. The Interrupted Fern will grow in the open sun, as will the Royal Fern if the soil is wet enough. In fact the latter reaches the height of its development in an open sunny bog and is the largest of the three under ideal conditions.

Ostrich Fern, *Pteretis nodulosa,* is another large-growing fern that is much used in gardening as it will stand full sun if planted in a moist spot. In nature it revels on the flood plain beside a brook or river. It makes its best development in such a place with its deep leafmold soil mixed with the silt deposited in flood time. It also likes a moist, springy bank in almost full sun.

Rattlesnake or Grape Fern, *Botrychium virginianum,* is one of a genus of ferns that has distinctive characteristics. Its roots grow deeper in the soil than do those of any other genus. The stem is half to three quarters underground. It seems to grow best in a ravine under butternut trees.

The Rusty Woodsia, *Woodsia ilvensis,* likes to grow in crevices in a rocky ledge almost in full sun. It gets its name from the rusty appearance of the fruiting fronds.

The best ferns for a sphagnum bog are the Chain Ferns: *Woodwardia areolata* and *Woodwardia virginica.* Both will grow in full sun in a soil entirely made up of living moss and decayed moss.

The Sensitive Fern, *Onoclea sensibilis,* is one fern that will grow in full sun in a bog and also will grow in dense shade in a bog or in dryer soil. It gets its name from the fact that it succumbs to the first frost in the fall.

Marsh Fern, *Dryopteris Thelypteris,* is another of the bog ferns that will thrive in either sun or shade so long as it grows in a bog.

The one fern for high, hot, dry locations in full sun is the common Bracken, *Pteridium aquilinum.* It has a range from Canada to Florida, and west to the Pacific.

We have been growing all these ferns under artificial shade in leafmold soil. All are easily grown and propagated by root division or by spores. Our usual soil mixture is one-half leafmold, one-quarter loam and one-quarter sand. The amount of shade used varies in inverse ratio to the amount of water supplied to the ferns. Rusty Woodsia will become rusty and dried up in the sun but under shade and with plenty of moisture will stay green all the fall. The most important thing in the cultivation of ferns is to grow them in a place where there is enough shade and to water them until they become established.

In planting put the roots of *Botrychium* about six inches below the surface of the soil. In the case of the ferns that have running rootstocks, such as Maidenhair, Hayscented, and common Polypody, plant them so that the buds are even with the surface and press in solidly so that they will not dry out. The larger ferns should be planted with their crowns above the surface of the soil but the roots should be planted firmly.

Ferns are very easily grown, and once established need no care other than a regular mulching each fall with leaves. They will well repay for any care taken in planting, and one can easily see the possibilities of beautiful garden effects with these native ferns.

Hardy Ferns Of Exotic And Horticultural Origin

Their Culture Described

By Stuart Longmuir [1]

WHILE flowering plants for the American garden have been largely brought here originally from other countries, the ferns that are in cultivation have usually been transplanted directly from the nearby woods. Most American gardeners have yet to learn of the pleasure of cultivating

[1] Mr. Longmuir is Head Gardener of Skylands Farm, the estate of Mr. Clarence Lewis at Sterlington, N. Y., where he has under his care in a woodland garden a collection of more than fifty species of hardy native ferns, besides an even greater number of species from distant places and various horticultural varieties.—C.H.W.

some of the European, Asiatic, and far western American species of ferns, as well as the interesting horticultural forms of some of our eastern natives.

On the whole, the ferns of the West Coast region offer the greatest difficulty here in the Northeast. A few have come through at Skylands in the shadow of some pine trees along a brook, but most of them find our eastern summers far too dry. Out of nearly sixty ferns of exotic or horticultural origin in our collection, the only West Coast natives which have proved at all successful are *Botrychium multifidum silaifolium*, *Pellaea mucronata,* and *Polystichum munitum*. More will be told of these ferns later.

Two of the most interesting ferns now in the collection are New Zealand natives: *Blechnum vulcanicum* (related to our deer fern yet bearing a closer resemblance to a polypody) and *Trichomanes reniformis,* a dwarf filmy fern with extremely small round pinnae of so deep a green as to appear almost blue. Both of these have been raised from spores which were shipped directly from New Zealand, and they have not yet been planted out. Whether or not they will prove hardy is therefore still a question, but the appearance of both of them suggests that, at least in a sheltered spot, they can withstand an ordinary winter here outdoors.

Another subject whose hardiness is yet to be tested in the fern-relative, *Selaginella Braunii,* from western China. It is perfectly hardy in North Carolina, where it is known to thrive in moist shade in a bed of leafmold and where, with its minute leaves overlapping each other on straw-colored stems, it makes a delicate and unusual edging plant.

The only variegated fern in the collection at Skylands—in fact, the only one I know—is *Athyrium Goeringianum pictum,* which has bluish-green leaves with central band of gray and purple stalks. It is a most attractive plant, only about 8 inches high, and it spreads widely whether growing in sun or shade.

Scented Ferns

Fragrance is something not usually associated with ferns, but in addition to our common native hay-scented fern (*Dennstaedtia punctilobula*), there are several other hardy ferns that share this quality, such as *Dryopteris fragrans,* which has a primrose scent, and *D. oreopteris,* with a lemon scent. Among others are the hay-scented buckler fern, *Dryopteris aemula*, also *D. Thelypteris pubescens* forma *suaveolens*, *D. crenata*, and *D. patens*. The fragrance of ferns is ordinarily noticeable only when the fronds are bruised or when they are dried.

Many of the Athyriums (which include the lady fern, *A. Filix-femina,* and its horticultural forms) make attractive plants for the shady garden. *A. laciniatum elegans*, for example, is a deeply cut form; the fronds of

A. Victoriae present a curious criss-cross effect, for some of the pinnae point diagonally upward from the rachis, while others point diagonally downward at about the same angle.

Species and forms of *Dryopteris* are always easy to grow as long as they are given a woodsy situation with a good soil consisting chiefly of leaf-mold and sand—with the exception of *D. fragrans* which grows on limestone cliffs in light shade. The male fern (*D. Filix-mas*), which is known in both America and Europe, may be obtained in a number of horticultural forms with crested, curled, and forking fronds. Variety *Pindari* is one of the smallest of them all, standing about 8 inches high with fronds resembling those of the deer fern (*Blechnum spicant*) but with somewhat broader and thicker pinnae. The serrate form of the deer fern, by the way, is an attractive plant for a moist situation.

Dryopteris Linnaeana plumosum is a delicate fern which spreads through the woodland garden, though never in dense clumps. *D. rigida* is a heavier grower but it is not large (about 18 inches tall) and it is one of the few ferns that will stand the sun; also, by the way, it is one of the ferns that require a limey soil.

The holly fern (*Polystichum Lonchitis*) can almost be classed among the exotics since it is native much farther north than New York City. It is a strong-looking fern, though fairly dwarf in stature, and its spiny leaves are hard in texture. It enjoys a limey and woodsy soil.

Some 2,500 miles away, in South America, is the native home of a near relative of this fern, *Polystichum aculeatum*. This is a coarser appearing plant in its manner of growth, but the leaves are less heavy in texture. In the west, ranging from Alaska down to California and as far west as Montana, is another species, *P. munitum*, the giant holly fern, a leathery, sharp-toothed, evergreen plant with enormous fronds, which is one of the few westerners to thrive in an eastern garden.

The European ostrich fern, *Pteretis Struthiopteris*, is practically the same as our native *P. nodulosa*, except that it is slightly less tall.

The royal fern (*Osmunda regalis*) is one of the most widely distributed of all fern species, for it is found wild in the temperate region of both America and Europe, as well as in tropical parts of South America and even in Africa. Moreover, given a moist, even a wet situation, it is one of the easiest of all ferns to cultivate, for it is the only one I know that will grow in clay, and it can stand any condition of light, from full sun to deep shade. The form that we have, designated as "spectabilis gracilis," is an especially handsome example of this fern.

A difficult subject to grow is the grape fern, *Botrychium*, for it does not transplant well and there is no way to divide it. Especially difficult is the western variety, *B. multifidum silaifolium*, which is more fleshy in texture than our eastern species. Its deeply cut frond and erect fruiting cluster give it somewhat the appearance of a flowering plant. We feel

fortunate that we have been able to keep it for three or four years at a time by giving it good leafmold and plenty of shade.

A fern that will spread extensively through the garden is the brittle fern, *Cystopteris fragilis,* of which we have a decorative form with the elaborate name of "regia lepidota polydactyla."

Lime-Loving Ferns

In the Middle West and beyond is a species of the lip fern called *Cheilanthes Feei,* named after the 19th-century French fern student, Antoine Fée. The bloom which covers the leaves of this delicate little fern makes it a plant of special attractiveness in the woodland or rock garden. It grows especially well on limestone.

Other lime-loving ferns among the exotics that we grow are the cliff-brake from California, *Pellaea mucronata,* which likes a fairly dry situation and a crevice for its roots. *Pellaea glabella* and *Asplenium resiliens* are other ferns that need a limestone soil, besides *Dryopteris fragrans* and *D. rigida* mentioned above.

For such as these we add crushed limestone to the soil for long-time action, and, for immediate effect we add also a little hydrated lime, and, whenever feasible, we set a limestone boulder in the garden as a background for the lime-loving species. Sometimes we make limestone pockets in the soil between two slabs of rock. The hartstongue ferns do especially well in such a situation, with the added protection of a sun-shielded northern exposure.

For general culture of ferns we use a good open soil consisting of leaf-mold, sand, loam, and peat. Most of the ferns require full or nearly full shade, hence they are suited only to the informal woodland garden. A few ferns, however, will do well if given half sun, among them the chain fern (of which we have the Eurasian species, *Woodwardia radicans*) the European polypody, (which like ours likes to grow on rocks), and the European ostrich fern, besides the varieties of *Athyrium* and *Dryopteris* mentioned above. These names do not include those of the native ferns, which are being treated in another article in this magazine, [2] but of which we also have a collection of more than fifty hardy species.

Most of the horticultural varieties of ferns in our garden have come from Europe, where much more extensive breeding and raising of ferns is done than in America. European catalogs will sometimes list many hundreds of varieties. These horticultural varieties are, for some reason, often less sturdy than the species types, but they make worth-while and interesting additions to the garden.

With few exceptions, such as the maiden-hair and its forms, which can only be handled after the leaves have died down in the fall, ferns may be divided or transplanted at almost any time of year. Also whenever

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[2] See the article by Isaac Langley Williams on page 59.—C.H W.

bulbils or plantlets form on those species which bear them, they may be transferred to pots and later set out in the garden. However, we have propagated most of ours from spores. There are four methods: (1) using nutrient solutions with which we have not had great success;[3] (2) sowing the spores on a sterilized flower pot which is inverted over a pan of water and kept covered with a bell-jar; (3) sowing the spores on sterilized peat in a sterilized pot, which is set in a saucer of water and covered with a pane of glass; and (4) sowing on sterilized soil in a terrarium, which is the method Mr. T. A. Weston has used for his hartstongue ferns.[4]

Raising Ferns From Spores

The important points, we find, are to sow the spores as soon as they are ripe, when this is possible, and to water them always with sterilized water which is soaked up from the bottom, never poured on from the top. Fern sporelings are highly subject to a disease resembling damping-off unless great care is taken to keep them under sterile conditions.

With the average fern the little prothallium appears in about a month, then in from four to seven months more, a tiny fern can be seen sprouting from this flat green structure. Within a year it can usually be potted up into a two or three-inch pot, and the following year it can go outdoors in the garden.

It is the condition into which ferns are placed that counts the most in their successful culture. One should never have to resort to feeding ferns artificially. Instead, the gardener should try to give them a location where they can permanently and adequately take care of themselves. An open sandy soil, or limestone soil if that is what they need, with ample leafmold; usually a shady location, moisture or dryness according to their individual demands, and then let them grow without further interference, into an adornment for the shaded part of the garden.

The list given below shows the number of hardy ferns of both exotic and horticultural origin that can be obtained in the trade (some with more or less difficulty, however) and made to thrive in a garden in the vicinity of New York.

ADIANTUM PEDATUM "KLONDYKE"
ASPLENIUM ADIANTUM-NIGRUM
ATHYRIUM ALPESTRE
— FILIX-FEMINA
— — CLARISSIMA
— — CONGESTUM MINUS
— — CORYMBIFERUM JAMESII
— — FRIZELLAE GRANDICEPS
— — — MULTIFIDUM
— — LACINIATUM ELEGANS
— — MULTIFIDUM
— PLUMOSUM DIVIRICATUM
— — — SUPERBUM PERCRISTATUM
— — VICTORIAE
— GOERINGIANUM
— — PICTUM

[3] In a later number of this Journal, Miss Clara S. Hires will describe the technique of propagating fern spores in jellied culture media under sterile conditions.—C.H.W.

[4] See the article on "Crested Hartstongue Ferns" by Mr. Weston on page 69.—C.H.W.

BLECHNUM SPICANT
— SPICANT PLUMOSUM FOSTER
— — F. SERRATUM
— VULCANICUM
BOTRYCHIUM MULTIFIDUM SILAIFOLIUM
CHEILANTHES FEEI
CYSTOPTERIS FRAGILIS (SP.) REGIA
LEPIDOTA POLYDACTYLA
DRYOPTERIS FILIX-MAS
— — ANGUSTATA CRISTATA
— — CRISTATA
— — FURCATUM
— — PINDARI
— FRAGRANS
— LINNAEANA PLUMOSUM
— OREOPTERIS
— RIGIDA
— SPINULOSA V. FRUCTUOSA
— — AMERICANA
— — INTERMEDIA
— THELYPTERIS PUBESCENS F.
SUAVEOLENS
OSMUNDA REGALIS SPECTABILIS GRACILIS
PELLAEA MUCRONATA
PHYLLITIS SCOLOPENDRIUM
— — VULGARE AUREO-VARIEGATA
— — — COUSENSII
— — — CRISPUM
— — — —
SAGITTATUM CRISTATUM PERRY
— — — FIMBRIATUM SPIRALE
— — — MURICATUM
POLYPODIUM VULGARE GLOMERATUM
POLYSTICHUM ACULEATUM
— — ACUTILOBUM DRUERY
— — CONGESTUM MINUS
— ANDERSONI
— LONCHITIS
— MUNITUM
PTERETIS STRUTHIOPTERIS
SELAGINELLA BRAUNII
TRICHOMANES RENIFORMA
WOODWARDIA RADICANS

Crested Hartstongue Ferns

By T. A. Weston [1]

WHILE I lived as a youth where hartstongue ferns were plentiful in the woodlands and along roadside ditches where the soil was part clay on top of chalk, I never once observed any but the plain smooth-leaved form known then as *Scolopendrium vulgare*. The name *Scolopendrium* was derived from *scolopendra,* a centipede, because of the way the spore-cases are placed. Today this fern is known as *Phyllitis Scolopendrium*.[2]

As far as I can gather, the hartstongue fern has been found in one or two places in New York State, in Canada and in Virginia, but never in the crested forms. There are, I believe, slight botanical differences between the European and American hartstongues in the way the spore-cases are carried, the American, which I have not seen, bearing spores the whole length of the frond. Just why this fern has never spread in view of its prolific production of spores is puzzling.

While the hartstongue fern is known in many parts of Europe, its real home apparently is Great Britain as it is there that all the crested forms have been found. I have never heard how many different crested varieties have been known in the wild, but it is not unlikely that some of the exist-

[1] Some specimens of crested hartstongue ferns from Mr. Weston's collection are being included in the Botanical Garden's exhibit at the 1940 International Flower Show.—C.H.W.

[2] This name was accepted by Christensen in the 1906 supplement to his *Index Filicum.*

FERNS FOR THE WOODLAND GARDEN

Polystichum scopulinum, a western relative of the Christmas fern.

The maidenhair, Adiantum pedatum, with the winged wood fern, Dryopteris hexagonoptera,

The male fern, Dryopteris Filix-mas.

The common American polyp
with Woodsia obtusa.

A shaded garden planted with the ostrich fern, Pteretis nodulosa.

The Christmas fern, Polystichum acrostichoides, is equally green in winter and summer.

The characteristic leaf-arrangement of Dryopteris marginalis. brought into cultivation. he lady fern, Athyrium Filix-femina (in the foreground), is found in the woods with the cinnamon fern, Osmunda cinnamomea.

The royal fern, Osmunda regalis, enjoys a site beside a pool.

ing forms have originated under cultivation through the bringing together of different types by enthusiastic collectors.[3]

It was my happy lot some forty years ago to visit Robert Bolton, then as now famous for sweet peas. He lived on the mountains of Lancashire and despite the shallow soil on rock, grew the finest peas possible. He also collected hardy British ferns, and even after he migrated to the south of England where he could harvest sweet pea seed with greater certainty, he continued ferns as a hobby but he never commercialized them. Some three years ago he made a gigantic garden group of all his various ferns, including a host of crested hartstongues, and created a sensation by exhibiting them in the Royal Horticultural Society's hall in London, gaining the highest possible awards and the felicitations of the R. H. S. Council. His ferns are, I believe, still grown as they were when I saw them forty years ago, in cold brick-walled frames.

Back in 1933 when writing Mr. Bolton, I asked if he ever sold any of his ferns and if he would let me have a few of his hartstongues. The reply was, "Still a hobby," but he sent some fronds so that I could raise all I wanted.

The spores were duly rubbed off and sown in a drum terrarium 12 inches in diameter and 12 inches tall with a wide mouth. It was well cleaned, filled to a depth of 2 inches with washed pebbles, then covered with 1 inch of scalded sphagnum plus 2 inches of pure peat-mold mixed with sand that had been scalded and then allowed to dry sufficiently to permit packing firmly. The spores were sown in February, a sheet of glass was placed on top and the drum was placed in a corner under a shelf where it was fully shaded and got the highest measure of heat from the pipes. The prothallia began to show within a month and by May the young fernlets were so numerous that I filled two flats with small clusters one inch apart. The balance I gave to a commercial friend who, I fear, never made any headway with them. By late fall I had more than 500 in thumb pots, standing on shelves in trays containing a thin layer of gravel to hold surplus moisture and prevent drying out. All told I imagine I raised well over one thousand fernlets from this one sowing, experiencing no trouble from the dread disease that is so prone to attack fern seedlings. A similar lot of spores sown at the same time in a 12-inch pan, covered with glass, produced very poor results because of the watering necessary and the consequent disease.

The young ferns were grown in the same pot the following summer in a shaded span frame and in the fall I picked out the best 100 or so and

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[3] The fact that choice crested hartstongues are far from common even in England and are listed only in limited variety by one or two fern specialists is probably due to the fact that the collecting of them is a hobby of only a few people, and if in the course of their scouting they have found a new one, they have kept it to themselves, selling neither divisions nor spores and rarely giving a specimen even to a friend unless they could make a worthy exchange.

sold the rest to a trade concern. The selected plants were shifted into 3- and 4-inch pots and kept the following winter under the greenhouse bench, regular potting soil being used. The following summer and each succeeding year they have been planted outdoors in early May under a burlap-covered framework, and in early October they have been lifted out and planted again in the span frame. I have not attempted any of them outdoors over winter, but I believe Clarence Lewis has some of the same stock established outdoors at Sterlington, N. Y.[4] The frame, by the way, is protected by one rush mat on the glass and in very cold weather everything is frozen solid.

The hartstongue ferns, if fully protected from hard frost, are evergreen, but I find a temperature of 25°F. is sufficient to injure the fronds severely. Once they reach mature size these ferns do not appear anxious to grow during the winter; one or two extremely crested and congested types I always keep indoors, but they never show any activity until spring.

I have about a dozen distinct variations in my plants, but oddly, not one of the plain types common to the species; the plainest have undulated edges, some are decidedly crested, others are sword-like with a surface like a rasp, and there are variations down to a type that is even more congested than *Hedera conglomerata*. Each sowing of spores reveals interesting variations from the species.

Fern Literature For The Student And Gardener

Compiled by Elizabeth C. Hall

THESE references to fern literature have been arbitrarily divided into two sections. The first group comprises those books and articles written in a somewhat popular style, while the second includes such works as taxonomic manuals, check lists, publications with excellent colored plates, and titles dealing primarily with the culture of ferns. Some, such as Slosson and Small, might go in either list.

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[4] See page 69.

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Ferns Of Antiquity

By Harold N. Moldenke

MANY of the plants which inhabited the earth in ages past have left their remains in the rocks as fossils. By a careful study of such fossils the paleobotanist is able to reconstruct a picture of the vegetation of the past. Fern plants play an important part in this picture.

It is generally believed that ferns first appeared on the earth sometime in the late Devonian Period, approximately 350 million years ago, at a time when fishes were the dominant type of animal life. One small piece of fern stem, called *Asteropteris* (because of the star-like form of the woody conducting tissue in cross-section), has been found in rocks of this age here in New York State. Exclusive of this, however, the earliest known fossil ferns occur in the Mississippian (early Carboniferous) rocks and are about 340 million years old. The Carboniferous Age was the age when amphibians were dominant in the animal world. Its duration was some 125 million years and during that time many ferns were developed, mostly, however, of families and genera entirely different from any living today—genera, in fact, which often combined in one form the characters which today separate several genera or even several families! The earliest ferns had usually leafless fronds and their sporangia were borne in single capsules or tassels pendulous at the ends of fine branches. It seems as though during this age evolutionary tendencies were still in an experimental stage, and it was not until much later, in the Mesozoic Era, or Age of Reptiles, that morphologic patterns became stabilized into forms which have largely persisted to the present day.

It is worthy of note that hundreds of Devonian and Carboniferous fossils from all over the world used to be regarded as the remains of ancient ferns because of their striking resemblances to modern fern fronds, and were, in fact, even placed in modern fern genera by early paleobotanists. It has since been discovered that a very great many of these fossils do not represent true ferns at all, but are the only remains of a once widespread and very important group of plants, the pteridosperms or fern-cycads, now entirely extinct. These plants did not bear the sporangia and spores of true ferns, but produced true seeds, some of which have been found still attached to the fern-like fronds. In this extinct plant group we find an important link between the ferns and the seed-plants of today.

An interesting fact is that our commonest fern family in the northern hemisphere, the Polypodiaceae, seems to have been poorly, if at all, represented in the very ancient floras. The earliest ferns are believed to have been more closely related to our present flowering-ferns (Osmundaceae), adderstongues (Ophioglossaceae), filmy-ferns (Hymenophyllaceae), and two small tropical families, all of which have at present a

very circumscribed distribution or are relatively insignificant. The widespread Polypody family of today is apparently a young group which has arisen from a position of insignificance into one of dominance among north temperate ferns.

Ferns Exhibited At International Flower Show

THE ferns of approximately 140 varieties which are listed below are included in the display of the New York Botanical Garden at the International Flower Show in Grand Central Palace, New York, March 11-16.

Fifty-four of them were imported from England under special permit, because they were not available in this country, and fifteen more were similarly imported from Canada. For these as well as for the native ferns and other more common kinds being shown, the Garden is chiefly indebted to five friends: Isaac Langley Williams of Exeter, N. H.; Stanley G. Ranger of New York, who is a Life Member of the Garden; T. A. Weston of the Florists' Exchange; and Mr. & Mrs. Edward D. Thurston, Jr., of Sharon, Conn. Except for the Thurstons' gift, all the ferns have been forced into growth for the show in the greenhouses of the Botanical Garden.

Gardeners will see in this exhibit examples of European, Asiatic, and far western ferns which will grow in the northeastern garden, as well as nearly forty horticultural forms of both native and exotic species.

In addition to this large collection of living ferns there are exhibited young ferns in various stages of development showing methods of raising them in soil, flower pots, culture solution and broken brick. There are also two or three fossil ferns in the exhibit.

In the list below, the names which are accepted in L. H. Bailey's Hortus are used so far as possible. The nomenclature accepted in Christensen's Index Filicum is used for names which are not included in Hortus.

Adiantum	
A. JORDANI	W. U. S.
A. PEDATUM	N. Am., Asia
— ALEUTICUM	Aleutian Isl.
Asplenium	
A. BRADLEYI	E. U. S.
A. PLATYNEURON	E. U. S.
A. RESILIENS	S. E. U. S., Mex.
A. RUTA-MURARIA	Circumtemperate
A. TRICHOMANES	N. Am., Eur., Asia
A. TRUDELLII	Hybrid
— CRISPA	Hort. form
A. VIRIDE	N. N. Am., Eur., Asia
Athyrium	
A. ACROSTICHOIDES	E. N. Am.
A. ALPESTRE LEPIDOTA	Hort. form
A. AMERICANUM	W. N. Am., Quebec
A. ANGUSTIFOLIUM	E. N. Am.
A. FILIX-FEMINA	W. N. Am., Eur., Asia
— CONGESTUM FOLIOSUM PERCRISTATUM	Hort. form
— — POLYDACTYLUM	Hort. form
— CRISTATUM	Hort. form
— CURTUM	Hort. form
— EXCURRENS	Hort. form
— FIELDIAE	Hort. form
— FRIZELLAE GRANDICEPS	Hort. form
— LACINIATUM	Hort. form
- PERCRISTATUM COUSENSII	Hort. form
— REVOLVENS	Hort. form
— SETIGERUM PERCRISTATUM	Hort. form
— VERNONA	Hort. form
— VICTORIAE	Hort. form
A. GOERINGIANUM PICTUM	Japan
Blechnum	
B. SPICANT	W. N. Am., Eur., Asia

Botrychium

B. DISSECTUM	E. U. S.
B. DISSECTUM OBLIQUUM	E. U. S.
B. LUNARIA	N. N. Am , Eur., Asia
B MATRICARIAEFOLIUM	N. Am., Eur.
B. VIRGINIANUM	N. Am., Eur., Asia

Camptosorus

C. RHIZOPHYLLUS	E. N. Am

Ceterach

C. OFFICINARUM	Circumtemperate

Cheilanthes

C. ALABAMENSIS	S. E. U. S.
C. CALIFORNICA	Calif.
C. DENSA	W. N. Am.
C. FEEI	W. and C. N. Am.
C. GRACILLIMA	W. N. Am.
C. LANOSA	S. and E. U. S.
C. TOMENTOSA	S. U. S., Mex.

Cryptogramma

C. ACROSTICHOIDES	Arctic Am. to W. U. S.
C. CRISPA	Eur., W. Asia

Cystopteris

C. BULBIFERA	E. N Am.
C. FRAGILIS	E. N. Am.
C. MONTANA	Circumboreal

Dennstaedtia

D. PUNCTILOBULA	E. N. Am.

Dryopteris

D. AEMULA	W. Eur., Madeira, Azores
D. AMERICANUM	
D. ARGUTA	W. N. A.
D. BOLLANDAE	
D. CRISTATA	N. E. Am., Eur., Asia
— CLINTONIANA	N. E. Am.
D. FILIX-MAS	N. Am., Eur.
— ANGUSTATA CRISTATA	Hort. form
— BARNES	Hort. form
— CRISPA CRISTATA	Hort. form
— DEFLEXA	Hort. form
— GRANDICEPS	Hort. form
— LINEARIS	Hort. form
— — POLYDACTYLA	Hort. form
— REVOLVENS	Hort. form
D. FRAGRANS	Circumboreal
D. GOLDIANA	E. N. Am.
D. HEXAGONOPTERA	E. and S. N. Am.
D. LINNAEANA	N. N. Am., Eur., Asia
D. MARGINALIS	E. N. Am., C. U. S.
D. NOVEBORACENSIS	E. N. Am.
D. OREGANA	Calif., Ore.
D. OREOPTERIS	N. W. U. S., Eur., Japan
D. PHEGOPTERIS	N. N. Am., Eur., Asia
D. POLYDACTYLA	
D. RIGIDA	W. N. Am., Eur.
D. SPINULOSA	N Am., Eur., Asia
— DILATATA	N. N. Am., Eur.
— — CRISTATA	Hort. form
— INTERMEDIA	N. E. N. Am.
D. THELYPTERIS	N. Am , Eur., Asia

Lygodium.

L. PALMATUM	E. U. S.

Notholaena

N. FENDLERI	S. W. U. S.

Onoclea

O. SENSIBILIS	N. Am.

Ophioglossum

O. VULGATUM	E. N. Am., Eur., Asia

Osmunda.

O. CINNAMOMEA	N. and S. Am , E. Asia
O. CLAYTONIANA	N. Am., Asia
O. PURPURASCENS	
O. REGALIS	N. Am., Eur., Africa
— CRISTATA	Hort. form
— SPECTABILIS	E. N. Am.
O. UNDULATA	

Pellaea

P. ANDROMEDAEFOLIA	Calif., Ore.
P. ATROPURPUREA	N. Am.
P. BRACHYPTERA	Ore., Calif.
P. BRIDGESII	Calif., Idaho
P. MUCRONATA	Calif.

Phyllitis

P. SCOLOPENDRIUM	E. N. Am., Eur.

Pityrogramma

P. TRIANGULARIS	W. N. Am.

Polypodium

P. CALIFORNICUM	W. U. S.
P. POLYPODIOIDES	E. U. S.
P. SCOULERI	W. N. Am.
P. VULGARE	W. N. Am., Eur., Asia
— ALPINA	
— LONGICAUDA	

Polystichum

P. ACROSTICHOIDES	E. to S. N. Am.
P. ACULEATUM	Old World, S. Am.
— ACUTUM	Hort. form
— CONGESTUM	Hort. form
— — GRANDICEPS	Hort. form
— DELTOIDEUM	Hort. form
— DIVISILOBUM CRISTATUM	Hort. form
— — DECORUM	Hort. form
— — GRANDE	Hort. form
— — PLUMOSUM	Hort. form
— GRANDICEPS	Hort. form
— HONORABILE	Hort. form
— PLUMOSUM	Hort. form
P. ANDERSONI	N. W. N. Am.
P. BRAUNII	N. N. Am., Eur.
P. LOBATUM	Old World, S. Am.
P LONCHITIS	Mts N. Am , Eur., Asia
P. MUNITUM	N W N. Am.
— IMBRICANS	N. W. N. Am.
P. PLUMOSUM COMPACTUM	
P. SCOPULINUM	W. U. S., Quebec
P. VIVIPARUM	W. Indies

Pteretis

P. NODULOSA	E. and C. N. Am.
P. STRUTHIOPTERIS	Eur.

Pteridium

P. AQUILINUM	Universal
— PUBESCENS	N. Am.

Woodsia

W. ALPINA	Circumboreal
W. ILVENSIS	N. N. Am., Eur., Asia
W. OBTUSA	N Am.
W. OREGANA	W. and C. N. Am.
W. SCOPULINA	Mts. N. Am.

Woodwardia

W. AREOLATA	E. U. S.
W. RADICANS	Europe, Asia
W. SPINULOSA	Mex., Guatemala
W. VIRGINICA	E. N. Am., Bermuda

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Plant Collecting and Gardening On Another Continent

THREE ACRES AND A MILL. Robert Gathorne-Hardy. 361 pages, illustrated with 21 photographs. Macmillan, New York, 1939. $4.

Those people who could not digest a solid bookful of plant habitat descriptions, travel stories, philosophy or anecdotes will find that these subjects together blend into a surprisingly informative and readable book.

The author records the development of his garden in England and tells of his plant collecting trips in France, Spain, the Canaries and Iceland. His habitat descriptions are accurately and vividly written and teach much concerning the cultural requirements of the choicer plants native to the places he visited.

There is probably insufficient scientific data to hold the interest of a botanist throughout, but there are enough unusually well written anecdotes to make up for this deficiency for a very wide range of readers.

With five stars as maximum for the class, this book merits four stars.

FRANK G. MACKANESS,
Dillard University, New Orleans.

Phenomena of Growth in Trees

TREE GROWTH. Daniel T. MacDougal. 240 pages; illustrated. Chronica Botanica Co., Leiden, Holland (now temporarily located at Jamaica Plain, Mass.) 1938. 7 guilders. ($3.50?)

This is the first volume of a new series of plant science books which are being published by the Chronica Botanica Company, until recently of Leiden, Holland, under the editorship of Frans Verdoorn.

Doctor MacDougal possesses unusual qualifications for authorship of a monograph on tree growth. His researches have been carried on over a period of many years and have been extremely fruitful. Nearly twenty years ago he published a volume entitled "Growth in Trees" as Carnegie Institution of Washington Publication 307.

The present publication deals primarily with the activity of the primary meristem and the cambium of stems, branches, and roots. Attention is continually focused on wood formation. Growth phenomena of representatives of many of the important tree groups in America are considered in detail. Five of the twenty chapters are devoted to growth in the pines. Less detailed treatment is accorded *Taxodium, Larix, Picea, Pseudotsuga, Sequoia, Cupressus, Fraxinus, Ulmus, Acer, Platanus, Fagus, Quercus, Juglans, Populus, Salix, Umbellularia, Arbutus, Parkinsonia, Phytolacca,* and *Carnegiea.*

In spite of the very large amount of investigation which has been directed toward a better understanding of growth in trees, many questions remain unanswered. The role of auxins in tree growth is poorly understood. Most of our information on the course of leader elongation is based on measurements of young trees and relatively few data relate to the behavior of mature or old trees.

Everyone interested in the growth of trees will find Tree Growth indispensable. Foresters in particular owe the author a debt of gratitude for his able exposition of this complex subject. If the reviewer were permitted one criticism it would be that the volume lacks an index.

H. J. LUTZ,
Yale School of Forestry.

Industrial Microbiology

APPLIED MYCOLOGY AND BACTERIOLOGY. L. D. Galloway and R. Burgess. 183 pages, illustrations, index. Chemical Publishing Co., New York, 1938. $4.

The authors of this small elementary volume have attempted to survey the field of mycology and bacteriology very briefly with the object of presenting a book to meet the needs of biologists, agricultur-

ists, industrial chemists and others interested in the scope and methods of industrial microbiology.

In Part I there are chapters on fungi, bacteria, apparatus, sterilization, isolation and examination of micro-organisms, culture media and stains, metabolism and control of micro-organisms. Part II includes chapters on food industries, hygiene, medicine, and agricultural applications.

In attempting to compress a great deal of information into a rather limited number of pages, the authors have condensed each subject to such an extent that the practical value of the book may be questioned. But it is recommended for those who desire a brief introduction to economic microbioliogy and a guide to pertinent literature on the various subjects treated. It seems necessary to add, however, that the price of the text is rather high for a book of this type and size.

THOMAS LASKARIS.

Flower Legends

STORIES AND LEGENDS OF GARDEN FLOWERS. Vernon Quinn. 235 pages, illustrated and indexed. Frederick A. Stokes Co., New York, 1939. $2.50.

Vernon Quinn has already provided us, for leisurely reading, with volumes on the lives and legends of seeds, leaves and roots. Now she adds the stories and legends of the flowers themselves, and tells us in very readable style the interesting tales of fifty blossoms. To mention only every tenth in the book, there are flax, lily, petunia, verbena and zinnia, and each of them, in the light of its legends, becomes more than merely an ornament of our gardens.

MARGUERITE FULLING.

Innocent Primer

THE A B C OF HOW TO GROW PLANTS WITHOUT SOIL. Anonymous. Charted Publications, New York, 1939. 25c.

The impression given is that the production of abundant flowers and vegetables free from all soil diseases and insects and the growing of prize-winning plants is easy, if they are grown without soil according to the directions included in this 12-page folder. Experience is a hard teacher.

W. J. ROBBINS.

Notes, News, and Comment

Ferns. One of the most recent publications of special interest to fern growers is a reprint of 17 pages from the *American Fern Journal,* Vol. 29, No. 3, in which Mrs. Susan H. Thurston tells how she and her husband successfully forced a collection of 60 species of ferns for the International Flower Show in 1938. This exhibit, staged by the Thurstons for the Millbrook Garden Club, will be remembered by many as one of the outstanding features of the show that year. The 60 ferns are listed and a complete table is given showing the rate of growth of each kind from the beginning of the forcing period to the week before the show.

Also included in the reprint is a practical article by R. C. Benedict of the Brooklyn Botanic Garden on "Growing Ferns from Spores." He takes up chiefly soil culture and clay pot culture and tells how to deal with pests. A concluding article is by Josephine Edson and Grace Griffeth of Rochester, N. Y., entitled "Our Way with Ferns"—which is to raise them from spores sown in a terrarium.

Fern Pictures. Photographs of native ferns taken by Rutherford Platt, Margaret McKenny, and several others, will be on exhibit in the Museum Building for ten days beginning March 7. They will include the original of the photograph reproduced on page 57 of this Journal.

Orchid Display. When the Union League Club of New York held its annual hobby show in its headquarters on Thirty-seventh and Park the last week of January, the exhibit which was most prominently featured was the orchid collection of Rodney W. Jones. Mr Jones, who is a member of the New York Botanical Garden, has been an orchid grower for the past seven years. Starting with a single plant, he now has more than 5,000 in a special greenhouse which he built for them at his home in New Rochelle.

Vitamins. Dr. William J. Robbins addressed the annual Plant Science Institute at Ohio State University, Columbus, Feb. 5 on "Vitamins as Growth Substances for Plants."

To America. The offices of *Chronica Botanica,* the international magazine for plant scientists, have been moved since the first of the year from Leiden, Holland, to the United States. The preliminary address in this country is in care of the Arnold Arboretum, Jamaica Plain, Mass. Beginning in April, it is planned to publish the magazine weekly. Other publications which are also under the editorship of Dr. Frans Verdoorn have likewise been transferred to this country.

Spingarn Material on Clematis Deposited at Garden

Correspondence, bibliographical material, herbarium specimens, photographs, and lantern slides relating to *Clematis* have been presented to the New York Botanical Garden by Mrs. Amy Spingarn, widow of J. E. Spingarn, who was America's foremost exponent of this genus of garden plants. Mr. Spingarn was a member of the Board of Managers of the New York Botanical Garden from January 1938 until his death last July. Previously he had been for some years a member of the Corporation.

The correspondence, which will be bound and filed in the library of the New York Botanical Garden, consists of several hundred letters, chiefly to and from other enthusiasts in the study of clematis.

Also in the library is a card catalog file containing five drawers filled with bibliographical references to the genus *Clematis*, its botanical species and horticultural varieties, the dates of their introduction into American gardens, and miscellaneous information about the group and its culture. In addition there are reprints of articles which Mr. Spingarn had written on clematis.

The herbarium which has been deposited at the New York Botanical Garden consists of 148 sheets, 84 of which represent true species of *Clematis* and 64 horticultural varieties.

There is in addition a large collection of photographs and slides, which are in the care of the horticultural department at the Garden.

Living material from Mr. Spingarn's garden at Troutbeck, Amenia, N. Y., is to be presented to the Botanical Carden later.

Edward S. Harkness

One of the New York Botanical Garden's greatest benefactors, Edward S. Harkness, died at the age of 66 Jan. 29. In 1926 and '7, when the late President Frederic S. Lee was individually campaigning for funds with which to expand the work of the Garden, Mr. Harkness contributed $300,000 toward the sum of a little over a million which Dr. Lee succeeded in raising.

Mr. Harkness was elected a member of the Corporation of the Botanical Garden Jan. 11, 1909, and retained the post until his death. From 1927 he was listed as a Benefactor among the special classes of membership in the Garden.

Festival of Bloom

For Sunday, March 17, when the conservatory display of spring bulbs is expected to be at its height, a special program on flowering bulbs and their culture is being planned, to be given in the Museum Building. It will be free and open to the public. Details may be obtained by calling the New York Botanical Garden.

The display in the Main Conservatories at that time will be featured by bulbs which have been given to the Garden by the Holland Bulb Industry of Haarlem, Holland.

SUPPLEMENT to the Journal of the New York Botanical Garden for March 1940.
Separate copies available upon request.

EDUCATIONAL PROGRAM

New York Botanical Garden

1940 - 1942

IN the program outlined on the following pages, the New York Botanical Garden offers opportunity for adult education of a type not available elsewhere in New York. The program is planned to meet the needs of several groups of students, among them *amateur gardeners* who desire to increase their skill in gardening and their knowledge and appreciation of plants; *professional gardeners* wishing to extend their knowledge of the plant sciences; *teachers and nature study leaders* seeking a closer acquaintance with native plants; and *college graduate students* in botany.

Facilities. The courses are all offered at the New York Botanical Garden, most of them in the Museum Building, where registration takes place. There the student will find at his disposal one of the largest combined horticultural and botanical libraries in the country. The herbarium of more than 1,900,000 pressed specimens of plants, all classified and labeled, serves as a reference collection for the botanist, and may be referred to by students under guidance of a member of the staff. As further aid and stimulation to the student's work, there are the indoor and outdoor collections of living plants, which, while arranged for esthetic enjoyment, also provide the substance for botanical and horticultural studies. There are, for example, the systematic collections of trees and shrubs, covering a large proportion of the Garden's 280 acres; there are also the collections of such groups of plants as irises, roses, peonies, asters, dahlias, and chrysanthemums, all clearly labeled; the Thompson Memorial Rock Garden, containing some 2,500 species of plants; and, in the conservatories, the economic plants, the cacti and other succulents, and the various groups representing the tropical flora. In the natural woodlands along the Bronx River and in the wild flower garden exceptional opportunity is offered for studying within the City of New York the native plants of the region.

Location. The Botanical Garden is reached by taking the New York Central to the Botanical Garden station; the Third Avenue Elevated to the Bronx Park Station; or the Concourse branch of the Eighth Avenue

Subway to Bedford Park Boulevard; or, by motor, driving up the Grand Concourse and turning east on Bedford Park Boulevard or Mosholu Parkway, or continuing just beyond the southern terminus of the Bronx River Parkway.

Prerequisites. In some of the courses, registration is limited (1) to students who have had experience in practical gardening, or (2) who have satisfactorily completed certain preliminary work, or (3) who can satisfy the instructor of their ability to take the course with profit to themselves. For such courses students should not attempt to register without making previous arrangements either personally or by letter.

Certain other courses are open to all, beginners as well as experienced persons in botany or gardening, but not beyond the maximum number of students indicated. This number is determined partly by the facilities at the Botanical Garden but largely by the impossibility of giving satisfactory instruction to groups of unwieldy size.

Fees. A fixed fee is charged for each course, payable at the time of registration. No part of this fee can be returned if the student is unable to attend or to complete the course.

Members of the New York Botanical Garden are granted a reduction in their fees, up to the total amount paid by them for membership. That is, an Annual Member may enroll without charge for a course or a single subject with a ten dollar fee, or for a course with a fifteen dollar fee by paying only five dollars; but the regular fee will be required at the beginning of the second term or for an additional subject studied the same year. A Sustaining Member, however, paying twenty-five dollars a year to the Garden, may enroll for both the first and second terms of the course in Practical Gardening, for example, without cost, and will be liable for only ten of the fifteen dollars fee for the practice term in the spring. Members, however, are subject to the same requirements as other students in entering the laboratory or practice term of study.

Members of Garden Club Affiliates are privileged to take any subject for one-half the normal fee.

Members of any class who pay a registration fee of ten dollars or more may, upon application, be enrolled as Annual Members of the New York Botanical Garden, and be privileged to receive the Garden's publications and partake of other advantages of membership, information about which will be sent upon request.

All inquiries should be addressed to The New York Botanical Garden.

TWO-YEAR SCIENCE COURSE FOR PROFESSIONAL GARDENERS

A two-year course of evening study, leading to a certificate upon the successful completion of the work.

This course, which is restricted to professional gardeners, nurserymen and commercial flower growers, offers training in the sciences which form the basis of good gardening. It does not treat of gardening practice. While primarily arranged for the student gardeners at the New York Botanical Garden, it is open to applicants who have had appropriate experience *and whose qualifications are approved by a committee of professional horticulturists.*

Each year of study consists of two terms and each term of two subjects of 12 sessions each. The satisfactory completion of eight subjects is required for the certificate which is awarded to successful students at the end of two years. New students may begin their studies with any subject other than Systematic Botany Laboratory.

Classes are held Monday evenings in the Museum Building, one meeting at 7:45 and one at 8:50. The fee for each subject is $5.

1A Systematic Botany

Principles of plant classification with discussion of the significance and scope of the species, genus, and family and the difference between botanical and horticultural varieties. Study of typical flower structure and the modifications which affect plant classification. Use of keys and definitions of terms found in botanical textbooks.

Oct. 6—Dec. 22, 1941 $5.

Instructor—Dr. H. N. Moldenke

1B Systematic Botany Laboratory

Detailed study, with the aid of a hand lens and dissecting instruments, of typical plants in 25 families which are important to horticulturists, with discussion of other plants in these families which are found in cultivation. Distinguishing characteristics of these groups of plants and study of their geographical distribution. A prerequisite for this subject is the successful completion of Subject *1A*.

Jan. 5—Apr. 6, 1942 (excluding Feb. 23 and Flower Show Week) $5.

Instructor—Dr. H. N. Moldenke

1C Plant Morphology

A study of the structure and development of the root, stem, leaf, flower, fruit, and seed.

Oct. 6—Dec. 22, 1941 $5.

Instructor—Dr. H. W. Rickett

1D Plant Physiology

Discussions of the synthesis and utilization of organic food substances by plants; their growth, development and reproduction; and the environmental factors which influence these processes, particular attention being paid to a basic understanding of the manner in which these processes are related to the various horticultural practices.

Jan. 5—Apr. 6, 1942 (excluding Feb. 23 and Flower Show Week) $5.

Instructor Dr. W. H. Camp

1E Plant Breeding

A survey of the aims, methods, and results of plant breeding, of the physical basis of heredity, of variation and of laws of inheritance. Special attention directed to horticultural plants in discussing such matters as the role of bud variation, polyploidy, hybridization and selection in the improvement of plants.

Jan. 6—Mar. 31, 1941 (excluding Flower Show Week) $5.

Instructor—Dr. A. B. Stout

1F Ecology and Plant Geography

An elementary presentation of the subject, including the nature of the environment and the reaction of plant life to it; vegetative forms of plants, the organization and behavior of plant communities, and the distribution of the principal types of vegetation over the world.

Oct. 7—Dec. 23, 1940 $5.
Oct. 5—Dec. 21, 1942 *Instructor*—Dr. H. A. Gleason

1G Plant Pests and Diseases

A study of plant diseases caused by fungi, bacteria, slime molds, viruses, malnutrition, common insects and faulty cultural practices. The nature, structure, life history and classification of fungi, methods of artificial culture and inoculation into plants; also methods of disease control through sanitary measures, soil treatment and fungicides.

Oct. 7—Dec. 23, 1940 $5.
Oct. 5—Dec. 21, 1942 *Instructor*—Dr. B. O. Dodge

1H Economic Botany

An introduction to the useful plants as applied in industry, medicine and food for man, with a discussion on the origin, history and the by-products of these plants.

Jan. 6—Mar. 31, 1941 (excluding Flower Show Week) $5.
Instructor—Mr. G. L. Wittrock

1I Soils and Fertilizers

The constitution of soils, the manner in which their physical and chemical composition affects plants, and how they are affected by different cultural treatment; and fertilizers, their origin, use and effects on plant growth. $5.
Instructor—

TWO-YEAR COURSE IN PRACTICAL GARDENING

Organized evening study, leading to a certificate upon the successful completion of the work.

This course is intended to meet the needs of both professional and amateur gardeners who desire to know more of the "how", "why", and "when" of gardening operations. Three terms of study are offered each year, the fall and winter terms being devoted to lectures, the spring term consisting of actual gardening practice. Students may enroll at the beginning of either of the fall or winter terms without being obliged to register for the entire course. The lecture classes are held Thursdays, 7:45 to 8:45 p.m., in the Museum Building. Outdoor and indoor gardening practice takes place as arranged at the opening session.

2A Fundamentals of Gardening

The basic principles underlying good gardening are studied. Consideration is given to the structure and physiological processes of the plant and to the environment in which it grows as these factors affect garden practice, particularly in relation to soils and their improvement, seed-sowing and vegetative means of propagation, planting, pruning, watering, feeding, mulching, shading, ventilating, and disease and pest control.

12 weekly lectures, Sept. 26—Dec. 19, 1941 (excluding Thanksgiving Day). $10.
Instructor—Mr. T. H. Everett

2B Outdoor Flower Gardening

Problems discussed include the maintenance of ornamental flower gardens and lawns, their preparation and planting. Plant material considered will include annuals, biennials, perennials, aquatics, bulbs, vines, roses and rock garden plants.

12 weekly lectures, Jan. 8—Apr. 2, 1942 (excluding Flower Show Week). $10.
Instructor—Mr. P. J. McKenna

2C Outdoor Gardening Practice

The student is given an opportunity to gain experience in the correct handling of tools and in carrying out the various operations of outdoor gardening. He is called upon to prepare ground for seed-sowing and planting, to sow seeds and transplant seedlings, to transplant larger plants, cultivate, water, fertilize, and to prune, stake, tie, and care for living plants. Open only to students who have satisfactorily passed the winter term in Outdoor Flower Gardening.

8 weekly sessions on Thursdays, 6:45—8:45 p.m., May 2—June 27, 1940 (excluding May 30), and April 30—June 18, 1942, the first class meeting in the Museum Building. $15.

Instructors—Mr. George Gillies
Mr. Robert Scott

2D The Cultivation of Trees and Shrubs

Woody plants are dealt with from the standpoint of their usefulness in the garden and their adaptability to soils and environmental factors. Consideration is given to their botanical classification and geographical distribution. The lectures include a general discussion of choice and lesser known woody plants as well as the more common subjects. Particular emphasis will be placed on their culture and maintenance, including propagation, planting, pruning, training and feeding.

12 weekly lectures, Sept. 26—Dec. 19, 1940, and Sept. 24—Dec. 17, 1942 (excluding Thanksgiving Day). $10.

Instructor—Mr. P. J. van Melle

2E Cultivation of Greenhouse Plants

Methods and problems involved in the cultivation of indoor plants are studied. Special consideration will be given to the propagation and growing of the more important crops, such as chrysanthemums, roses, sweet peas, carnations, begonias, poinsettias, cyclamens, primulas, forcing bulbs, etc. Attention will also be directed to a selection of the more unusual greenhouse subjects.

12 weekly lectures, Jan. 9—Apr. 3, 1941 (excluding Flower Show Week). $10.

Instructor—Mr. J. W. Tansey

2F Indoor Gardening Practice

Actual practice in work connected with the growing of plants in coldframes, hotbeds, and greenhouses is afforded. The student is called upon to prepare seed flats, sow seed, transplant seedlings, make and insert various types of cuttings, and pot and repot growing plants as well as perform other work incidental to the propagation and care of plants indoors. Open only to those who have successfully completed the winter term in Cultivation of Greenhouse Plants.

8 weekly sessions on Thursdays, 6:45—8:45 p.m., May 1—June 19, 1941, the first class meeting in the Museum Building. $15.

Instructors—Mr. James G. Esson
Mr. Edwin Beckett

3A ROCK GARDEN CONSTRUCTION

The basic principles involved in the construction of rock gardens, wall gardens, and similar features, including a consideration of types of rock, soil mixtures and the mechanics of construction.

Class meets for 12 weekly sessions, Tuesdays at 6 p.m. Registration and opening session in the Museum Building, followed by a preliminary tour of the Thompson Memorial Rock Garden.

May 21—Aug. 6, 1940 $15.
May 19—Aug. 4, 1942

Instructor—Mr. A. C. Pfander

4A GARDEN APPRECIATION

Designed to present a botanical and historical background to the plants and practices used in gardening, and to increase appreciation for the art of gardening and for plants in cultivation.

This subject is analogous to courses in music and art appreciation and will cover what may be called our personal relations with garden plants. The student's attention is directed to such topics as the following: (a) Geographical origins of garden plants, romance of their discovery, development in gardens and association with human interests. (b) Botanical relationships; that is, the distinguishing characteristics of the various families and other groups, with suggestions on how one can judge the cultural needs of a plant by knowing something of its relationship and origin. (c) The form and structure of plants, so that the student can distinguish a bulb from a tuber or corm, a bract from a leaf, true flowers from bracts, and understand the function of the parts that are found within the flower.

The class will meet on 12 Tuesdays from 3:30 to 4:30 p.m., with opportunity for discussion at the close of the hour. The time will be given to lectures, demonstrations, and trips through the grounds and the conservatories. Enrollment limited to 25. $10.

Apr. 2—June 18, 1940
Mar. 31—June 16, 1942

Instructor—Dr. H. W. Rickett, assisted by Mr. T. H. Everett

5A THE LITERATURE OF GARDENING

An introduction to the best gardening literature, from the earliest reference works down to current books and periodicals.

Eight sessions of approximately two hours each to be given in the library on Monday evenings at 7:45 p.m. The course will consist of lectures, demonstrations, and actual reference work to give the students practical experience in using gardening literature to the best advantage. Topics covered include botanical and horticultural illustration (flower and fruit prints), reference works, gardening periodicals, early garden books and herbals, plant monographs, books of inspiration and exploration, works on landscape design, and current gardening books.

Oct. 7 -Nov. 25, 1940
Oct. 5—Nov. 23, 1942

$10.

Instructor—Miss Elizabeth C. Hall

FIELD BOTANY

A course in identification of the plants of the local area, given through arrangement with the New York Association of Biology Teachers, but open to anyone above high-school age. Alertness credit will be granted to teachers who complete the work satisfactorily. The course covers a general study of the plants to be found growing wild in the vicinity of New York, and thus includes studies of native trees and shrubs, in their winter aspect as well as when in leaf, also of ferns and flowering herbaceous plants, as well as the more common mosses, lichens, and mushrooms.

6A Spring Term. Saturdays, 1 p.m. nine sessions to be arranged, totaling 30 credit hours of work. Nearby field trips, lectures, demonstrations, studies in the herbarium, and two all-day field trips to be arranged in the spring. Minimum registration accepted, 20 students; maximum, 25. Fee—$10, to teachers, $5.

Feb. 15—June 7, 1941

Instructor—Dr. W. H. Camp with assistants.

6B Autumn Term. Saturdays, 1 p. m., nine sessions to be arranged, totaling 30 credit hours of work. Field trips in the autumn followed by indoor lectures, demonstrations, and studies in the herbarium during the winter. Minimum registration accepted, 20 students; maximum, 25. Fee—$10, to teachers, $5.

Sept. 14—Dec. 21, 1940
Sept. 12—Dec. 19, 1942

Instructor—Dr. W. H. Camp with assistants.

GRADUATE COURSES IN BOTANY

Classes conducted by members of the staff of the New York Botanical Garden for graduate students in botany at Columbia University and at Fordham University.

Hours and credits for these courses are arranged on consultation and must be recorded and tuition paid at the office of the Registrar at Columbia University or at Fordham University. All are given at the New York Botanical Garden. Permission of the instructor is required of all students before registering.

Botany 213-214—Plant Pathology. 2 to 8 points each session. Instructor—Dr. B. O. Dodge.

Botany 215-216—Physiology. 2 to 8 points each session. Instructor—Dr. William J. Robbins.

Botany 227-228—Morphology and Taxonomy. 2 to 8 points each session. Instructors:—lower plants—Drs. B. O. Dodge and F. J. Seaver; seed plants—Drs. H. A. Gleason, W. H. Camp, H. N. Moldenke, and A. C. Smith.

Botany 243-244—Problems in Plant Breeding with Special Reference to Sterility in Plants. 2 to 8 points each session. Instructor—Dr. A. B. Stout.

Botany 307—Reproduction in the Lower Plants. Two hours, lectures and seminar. 2 points, winter session. Special treatment of the fungi. Instructor—Dr. B. O. Dodge.

Botany 308—Reproduction in the Seed Plants. Two hours, lectures and seminar. 2 points, spring session. Special survey of sterilities. Instructor—Dr. A. B. Stout.

Colloquium, a bi-weekly meeting on the 2nd and 4th Tuesdays of each month at 8:15 p.m. at 710 Schermerhorn Hall, Columbia University, is open to students taking the courses outlined above, as is also the monthly conference at the New York Botanical Garden, at which staff members and students report on the results of their research or review the progress of research elsewhere.

* * * * * *

SATURDAY AFTERNOON LECTURES

During the autumn, winter, and spring, a weekly series of lectures is given at the New York Botanical Garden on Saturday afternoons. Beginning at 3 o'clock and lasting one hour, these lectures are illustrated by colored lantern slides and are often accompanied by exhibits and demonstrations. In the library each week there is also a special shelf of reference books on the subject of the preceding Saturday.

These lectures are free to the public and no registration is required. Non-technical in nature, they cover phases of gardening and nature study, travel and plant exploration, and informational subjects such as Chinese food plants, herbs and their uses, plants in industry, drug plants, plants of the Bible, and plants used by the Indians.

A card announcing the titles will be mailed upon request.

THE INSTRUCTORS

Mr. EDWIN BECKETT, Superintendent of the estate of Mrs. Herbert N. Straus, is known for his successful culture of many exacting greenhouse plants.

Dr. W. H. CAMP, Assistant Curator, has had long teaching experience in general botany, morphology, and taxonomy, including ten years at Ohio State University.

Dr B. O. DODGE, Plant Pathologist, is responsible for disease and insect control at the Botanical Garden and for the studying of new diseases and pests and developing methods of eradicating or controlling them.

Mr. J. G. ESSON, Superintendent of the estate of Mrs. Roswell Eldridge, raises plants annually for prize-winning exhibits. He is also known as a writer and lecturer, particularly on the culture of plants in the greenhouse.

Mr. T. H. EVERETT, Horticulturist, received his training at the Royal Botanic Gardens at Kew, England. He has charge of the indoor and outdoor collections and displays of living plants at the Botanical Garden.

Mr. GEORGE GILLIES, Head Gardener of the Marshall Field estate, is well known as an exhibitor and prize-winner in many classes at the International Flower Show.

Dr. H. A. GLEASON, Assistant Director and Head Curator, has been known for many years as a leading plant taxonomist and ecologist.

Miss ELIZABETH C. HALL, Librarian, is a graduate both of the Columbia University Library School and of Ambler School of Horticulture, as well as of Radcliffe College.

Mr. P. J. McKENNA, Chief Assistant to the Horticulturist, is immediately responsible at the Garden for the planning and overseeing of the outdoor flower gardens.

Dr H. N. MOLDENKE, Associate Curator, has been on the scientific staff at the Botanical Garden since completing his graduate work at Columbia University in 1934, working chiefly on the systematic classification of plants.

Mr. A. C. PFANDER, Assistant Superintendent, with many years of experience in the construction of rock gardens, is chiefly responsible for the design and construction of the rockwork in the Thompson Memorial Rock Garden at the New York Botanical Garden.

Dr. H. W. RICKETT, Assistant Bibliographer, is the author, with the Director of the Garden, of a well known college text book of botany.

Dr. WILLIAM J. ROBBINS, Director, is a plant physiologist and is co-author of Robbins & Rickett, "Botany." He has also published many scientilc papers, dealing chiefly with plant growth, as it is affected by vitamins.

Mr. ROBERT SCOTT, Head Gardener of the estate of Mrs. A. W. Burden, has received his training in some of the finest gardens in Scotland; his excellent cultural practices have brought him many flower show prizes in this country.

Dr. F. J. SEAVER, Curator, has charge of the Garden's herbarium collection of 275,000 fungi, and is also Editor of *Mycologia*.

Dr. A. C. SMITH, Associate Curator, is a plant taxonomist whose principal studies are made with the large collections of plants which he has brought back from expeditions into little-known sections of South America and the Fiji Islands.

Dr. A. B. STOUT, Curator of Education and Laboratories, is known throughout the world for his studies of plant breeding and reproduction in flowering plants.

Mr. JOSEPH W. TANSEY, Greenhouse Foreman at the Garden, is a graduate of Cornell University and is immediately responsible for the production of the Garden's plants for indoor display.

Mr. P. J. VAN MELLE, a nurseryman in Poughkeepsie, is a horticulturist of broad practical experience as well as scientific background, and is widely known for his informative lectures and his sound horticultural writing.

Mr. G. L. WITTROCK, Custodian of the Herbarium, has made extensive studies of the useful plants of the world and has, incidentally, assembled a most complete bibliography on plants used by the American Indians.

THE NEW YORK BOTANICAL GARDEN

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Elon Huntington Hooker, Chairman; Mrs. Carl A. de Gersdorff, First Vice-chairman; Mrs William A. Lockwood, Second Vice-chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

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CAROL H. WOODWARD, Editor
April, 1940

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SPECIALIZED INSTRUCTION

In issuing its Educational Program in booklet form, the New York Botanical Garden is presenting to the public courses in gardening and botany of a type quite different from those of any other institution. The aim is to give instruction in subjects for which the Garden is especially fitted, rather than to duplicate work of others.

High schools and colleges, for instance, have courses in botany for qualified students: schools of horticulture, agriculture, and landscape architecture fill a need for another particular group. But at the New York Botanical Garden, in the course for professional gardeners, selected young men who are earning their living here have the opportunity to combine an exceptionally varied practical experience in gardening with the chance to study, under the scientific staff, those scientific subjects that bear directly upon their work as gardeners.

In the practical course, professional men of long experience give weekly instruction in gardening to a diverse group of enthusiasts, including lawyers, lecturers, writers, professional gardeners, stenographers, artists, librarians, housewives, and persons of many other occupations.

Garden Appreciation, Rock Garden Instruction, the Literature of Gardening, Field Botany—these are all courses which an institution like the Botanical Garden is especially adapted to offer. Its combination of gardens, greenhouse collections, woodland areas, and extensive library and herbarium, as well as the qualifications of its staff, make it possible to cover a field of instruction unavailable anywhere else.

The work offered to graduate students in botany at Fordham and Columbia Universities is likewise effective because of the special facilities available.

For those who do not wish to register in a formal course, the Garden offers without charge its Saturday afternoon lectures as one phase of its unique program for public education.

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York, N. Y. Entered at the Post Office in New York, N. Y., as second-class matter. Annual subscription $1.00. Single copies 10 cents. Free to members of the Garden.

LIBRARY
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VOL. 41 APRIL 1940 No. 484

Achiote, The Blood Tree

By Victor Wolfgang von Hagen

OF all the useful contributions of the American Indian—such as potato, pumpkin, cocaine, ipecac, and quinine—none has had such a curious and mystical application in the lives of the natives as the seeds of the achiote. While the scarlet pulp surrounding them is used as a coloring for food, it is of even greater importance as a symbol of blood—emblem of life and of power—and as such is used in daily practice and in special ceremonies.

Almost everywhere in the American tropics, from the lush hot regions to the cold Sierras, the achiote may be found. It is a small tree or shrub seldom more than 16 feet high, blooming three times a year, the flowers followed by clusters of soft-spined burrs at the ends of the branches. Upon drying the burrs split open to reveal their vermilion-coated seeds, each about the size of the seeds of a large grape. When held in the hand the aril, or soft coating, instantly exudes a scarlet dye. This is the blood symbol.

It did not take the Spanish explorers long to find a use for this powerful coloring matter, and soon it was being employed throughout all Europe as a dye. In the United States today tons of it are imported annually for the unromantic but practical purpose of coloring cheese and oleomargarine. As it is one of the few harmless vegetable coloring media that will meet the requirements of the stringent pure food laws, its use may be widely extended in the future.

When we add it to our food we are imitating a custom of the primitive Indian many centuries old. Although seemingly tasteless to our palate, it is used quite often in a condiment made with hot chile peppers and is generally mixed with the food of the South American mountain Indians. Potatoes, soup, rice and meats served at the Andean fairs in Peru, Ecuador or Bolivia are always colored with it. An Indian would hesitate to eat

Flowers of the achiote (Bixa Orellana) with young fruits at the tips of the branches.

his food unless it were colored, and the cook never fails to stir a handful of the seeds into the stew. Montezuma, the Mexican emperor, used it regularly. It was his habit to quaff many jars of chocolate daily, and the recipe given by the Spanish conquerors mentioned chocolate flavored with vanilla and tinted with achiote, the mixture beaten into a red froth by means of a whirling MOLINILLO.

But the chief use of the achiote is not the flavoring of food. In the past (as now) it has been used for painting the body by the uncivilized and semi-civilized Indians all the way from Mexico to Patagonia. The Negro-Suma Indian hybrids of the Mosquito coast of Honduras, for one example, paint themselves with it when they go hunting or fishing.

To prepare the dye the capsules of the tree are gathered and the seeds are split and placed in a pot of boiling water to remove the testa or waxy substance surrounding the aril of the seeds. Then the red wax is passed through a sieve and made to coagulate into a thick maroon paste by the

addition of leaves of the tiswat tree. The thick substance is then poured into small gourds and placed on the rafters for use during hunting festivals. Formerly the Miskito women would paint their menfolk before they embarked on a fishing expedition to hunt the great manatee, or before they left to enter the jungle for the search of wild pig. The achiote paste would first be thinned and tempered with high-smelling vegetable oils; then decorative designs would be drawn upon the faces and bodies of the hunters with small sticks called AULALA-DUSA. This was done in an intricate series of dots, dashes, and geometrical figures.

The hereditary enemies of the Miskito people, the Sumus, who live in the interior of the Mosquito coast, adopt a different manner of painting but always use the achiote as a base. When going to war with the Miskito UPLA (people), the men would paint themselves black on one side, red on the other, and in this ferocious aspect they would war upon their enemies.

Among the Headhunters of the Upper Amazon, with whom I lived for some months in 1933-34, the achiote is considered a magical tree and like all the plants they cultivate is attributed with a WAKANI or soul. Since this magical achiote bush, which they call IPIAKU, has a female soul, it is the custom to entrust its care to the women, who harvest the seeds and press them into small bamboo vessels which are given to both men and women to carry. A Headhunter, like a "civilized" woman, would never be caught without an achiote rouge tube—for who knows where and when it might be needed? To an Indian, and especially to the Headhunter, danger lurks everywhere; the air, the rivers, are filled with evil genii who are constantly seeking to inflict harm, and using achiote dye is one means of combating this evil influence. Primarily, the painting of the face with achiote, which is done by making large round circles about the cheeks, is of combined religious and magical significance. Often the dye is mixed with the oil taken from the mysterious cave-dwelling nocturnal oil-bird, and then the color is said to possess much power against the evil-eye, and is a good augury for hunting. Some Headhunters even regard it as a love charm and in this use of achiote the Headhunters are not unique, as all the Indians of the great Amazonian watershed use it for the same purpose.

The name by which it is known to the European market, URUNU, comes from the Tupu languages of a lower Amazonic tribe. In France the dye is known as URUKU; in Italy and in the United States, it is called ANNATTO;* while it becomes FAROH in the British colonies and ORLEAN to the Dutch in their South American colony of Surinam. In Central and South America the material is best known under the ancient Mexican name of ACHIOTE, adopted from the Aztec word ACHIOTL. It was first described botanically by Linnaeus under the name of *Bixa Orellana*, the specific name being the common name in use by certain Amazonian tribes.

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* Other spellings of this word are ANATTA, ANATTO, ANOTTO, and ANNOTTO.

At left, a young Colorado Indian preparing achiote to dye his body red for a special ceremony. Below, a native with reddened body and characteristic hair-cut. Beside him, Mrs. Christine von Hagen, who aroused curiosity because she painted only her lips red.

While all Indians in these regions paint themselves with the achiote, none have reached such a stage of decoration as have the Colorado Indians of western Ecuador. If some are wont to complain about modern women being over-rouged, what are we to think of a whole tribe of people who color themselves red from the top of their hair to the bottoms of their feet?

With such a custom the Colorado Indians remain unique, for they are never seen without this brilliant scarlet paint derived from the seeds of the achiote.

They are a curious, little known tribe of Indians living at the base of the western Andes in the province of Esmeraldas. There are now only 125 left, but they numbered thousands before the conquest of the Inca by the Spaniard. During one of the sorties by the conquerors these inoffensive red men were discovered and named the Colorados or "Red Ones." These Indians, who are related to the ancient Chibchas of Colombia, have accentuated many of their ancient customs to the point where they believe it always necessary to dye their bodies red. The process is complicated and the dye takes some time to apply. The capsules of the achiote are emptied on a banana leaf and quantities are taken into the hand, expectorated upon, and rubbed for a while until the hand is thoroughly coated; then the red dye is systematically rubbed into the hair, down to the roots. The Colorados do not remove the natural wax testa of the achiote, therefore the hair becomes stiff. It is later combed and then cut with scissors so that this coiffure looks something like the old-time "bowl-trim," with the exception that the hair hangs down in front of the eyes, necessitating the Indian's leaning backward in order to see forward.

Over the brilliant red they sometimes paint geometrical black lines from the juice of the fruit of the genip (*Genipa americana*), a large fruit that yields a harmless black dye (another commodity for which modern commerce is searching).

Curiously enough, the woman of the tribe does not color herself completely red, but only dyes her face. She uses the achiote for other purposes, however, such as the dyeing of cloth. Whenever the Colorado moves away from the house to work in his plantations, or to fish or to attend a festival, red coloring is applied. He is thus never without it and in this custom one sees the entire compass of superstitions of the American Indian exemplified.

Why do they color themselves and why do they use achiote seeds for this purpose? In primitive reasoning, to be full of blood means to be alive; to be without it means to be dead; to them blood possesses a vital being apart from the body and is thus magical and mystical. To the Indian to be of the same blood is to possess the same vital spirit that makes them all of the same single living unit. To them this is what blood relationships really consist of.

In far-away Australia, tribes of natives who are at enmity with one another may meet to end their bad relations; the peace conference always contains a blood-drinking ceremony wherein each tribe drinks the fresh blood of another. In Australia, where the achiote bush does not exist, the

natives smear their bodies with another symbol for blood—that of red ochre—which has the same effect on them as the achiote has on the Colorado Indian. It is not only a decoration (although to the Colorados it may now mean only this), but is a means of protection against unseen forces, malignant principles, death and evil, and is the only agent that can overcome witchcraft and the countless evil forces that animate the whole organic and inorganic world. By smearing on blood or the symbol of blood the Indian becomes possessed of tribal blood-power and inherits all its collective strength; thus he can do battle with the genii of evil, not as an individual, but as the whole tribe. Since achiote is the special symbol of blood, and the symbols of Indians are realistic in their eyes, achiote is not only the symbol of blood—it *is* blood; and thus the Colorados go through their lives day and night clad in a fiery mantle of red to ward off the principles of evil.

It became highly ludicrous to my wife to see the men decorating themselves with the same pomposity as modern women, and to the men of the Colorados she became in turn the same object of wonder and amazement when she, like themselves, decorated her face. On one occasion, she applied rouge to her lips and cheeks in front of them. While the men gaped in wonder, a little Colorado boy, scarlet-red like the men, came forward and asked, "Why don't you put the red all over your body as we do, why do you only put it on your lips?"

Ground-Covers For Difficult Places

By Mabel Choate

SOME years ago, when I took over "Naumkeag" in Berkshire County, Mass., there were just two kinds of ground-cover on the place, pachysandra and vinca. The pachysandra was planted where the growing and mowing of grass had proved impossible, and the vinca under tall shrubs in places inaccessible to anything but weeds. The idea of having ground-covers in order to gain effects of space, distance, design, or contrast of color had never occurred to anyone; nor had the idea penetrated that their use might do away with the expense of having two men mowing lawns for two days a week, as had been customary in the good old Victorian days.

Now, after ten years, almost all the difficult places are filled with something other than grass, and the variety of plants used is a constant source of delight to myself and of surprise and interest to visitors.

Where the trees are thick there is a dense planting of natural woodlands undergrowth. Maidenhair and other ferns of various kinds, jack-in-the-pulpits, wood-lilies, wild geraniums, and cypripediums all love to grow there; and among these we have planted *Lilium auratum*, which had disdained the garden, and the pink *L. speciosum*, and they have grown magnificently. Where there is some sun we have the native yew, *Taxus canadensis*.

Nearby on a gentle shady slope the large stretch of pachysandra which had become monotonous has been broken up by placing broad-leaved funkia (*Hosta*) at eight-foot intervals, with the result that a green polka-dotted carpet seems to have been spread beneath the tall trees.

Cutting into this come three coves planted with three different varieties of *Ajuga reptans*, and as these coves are edged with narrow brick paths they stand out in strong relief, one light green, one dark green, and the third bronze. Looked down upon from the windows of the house they make a charming pattern, and their economic value is enormous.

Ajuga grows with lightning speed, and nothing hurts it. Planted sparsely, the first year it takes hold and begins to spread. The second year there are great patches which clamor to be thinned out; if this is done, and the whole space evenly covered, the third year will find it a thick solid mass of ajuga. Then, no more weeding, and the only thing left to be done is to run the lawn-mower over it once during the summer to remove the tall, spike-like, and unsightly seed stalks.

To me, the most important variety of this useful plant is *Ajuga reptans variegata*, which is so very light in color that it is almost white. Planted on a steep bank that runs down from the house terrace, it starts in two strips fifteen feet wide. These soon unite and flow together down the hill in a broad white river until it reaches the orchard a couple of hundred feet below.

This effect of a white river is heightened by the fact that it is bordered by a broad ribbon-like band of deep green germander which grows in a thick low mass. Teucrium (germander) *does* die down somewhat in winter, but it comes up regularly again in the spring, and although it requires some weeding, as its growth is not so solid as the ajuga, and it must have its tall mauve flowers cut off, it is a pretty good substitute for boxwood in such a planting as this.

Beyond this band of teucrium is a long curved high bank that is hard to cover, both because we are anxious not to disguise its shape, and also because it is so difficult of access that we want to avoid any growth of weeds.

The first experiment was rather a failure: a thick planting of roses, which sounded perfect—foliage green and shiny, flowers beautiful, and growth thick enough to discourage weeds. However, what happened was

that the roses enjoyed themselves so thoroughly that they went completely haywire. Thick canes stood straight up in the air, hiding the lovely curve of the bank; or where they did decide to lie down, they reached out for ten or twenty feet, and yet were so far apart that weeds grew between them like magic. No one who has not tried to weed such a bed can imagine the torture of walking among the thorns.

Now we have taken out most of the roses, only leaving the flattest-growing varieties, such as the ***Evergreen Gem***, and those at sufficiently wide intervals to admit of convenient weeding and pruning. To these we have added numbers of clematis, and this, with vinca at the top and bottom of the bank, we hope may be a success.

One of the most curious things about gardening is the extraordinary effect made on plants by the difference of environment. In my woods, there is a thick undergrowth of bishops-weed (*Aegopodium Podagraria variegatum*), so low and white and pretty that we thought it would look well in the open; and at the expense of vast labor we transplanted a tremendous amount to a long slope near the house. Delighted with its new position, the bishops-weed grew three feet tall, and produced a long plume-like flower on its top. Not content with that, it burnt a horrid brown where it was turned to the full sun, so that after a couple of years trying to keep it cut down, we acknowledged it a failure, and dug it all up, and that is where we now have the white ajuga.

At the bottom of the hill, under a group of evergreen trees, is a bed of *Nepeta Hederacea variegata,* whose light color draws the eye into the shadow and gives more width and distance to a small path leading into the woods. This is a pretty, delicate looking plant with heart-shaped indented leaves, creeping, hardy, and shade-loving and spreading slowly but steadily. A rather fairy-like growth, very different from other ground-covers.

A very steep high bank that lies between the greenhouse and the cutting garden has always been an eyesore, and now at last it is almost covered with a delightful trailing vine of rapid growth: *Duchesnia indica* or mock strawberry. If small plants, started in the greenhouse, are put out in the spring, by late summer they form a thick cover, so that there is no room for weeds and they fall down the bank in fine fashion. Duchesnia has the advantage, too, of having pretty yellow star-like flowers and later bright scarlet berries.

Another bank, neither so high nor so steep but also difficult of treatment and quite long, is covered with blocks of alternating green and gray. First on each end is a block of coral bells (*Heuchera*) growing in thick tufts of shining leaves; its flowers so fragile and pretty that when it is in bloom it seems to hang like a pink veil over the bank. Next to that is a block of gray-leaved sun-rose (*Helianthemum*) and next to that again

the same plant, but with green foliage. Their lovely rose-like flowers are a great asset too, and even when the petals fall they may lie there undisturbed, looking like a light fall of snow.

Of evergreen ground-covers there are many, and perhaps in our northern climate they are more grateful to garden-lovers than the deciduous plants.

Around the house a thick carpet of *Hedera Helix baltica* seems to give a sense of stability, and its dark green color is very becoming to the architecture of the house. Charles McKim, the famous architect, once said to me: "We have too much architecture in this country." And the more I know of plants and gardens, here and abroad, the more I see what he meant.

Almost the most beautiful of evergreen ground-covers is *Asarum europaeum*, or European wild ginger. Very different from our native plant, its leaves are intensely glossy, very deep green, quite large, and heart-shaped. It loves the shade and grows in a deep thick mass; but it is hard to start from seed and few nurseries keep it. It spreads rather slowly, but is very hardy and well worth the time it takes to start.

Vinca, of course, comes in many varieties, all beautiful, hardy and useful.

Another good-looking evergreen is *Pachistima Canbyi*, which in leaf looks rather like *Daphne Cneorum*. It is small-leaved and of spreading growth, but is more difficult to please than the other plants mentioned. Having tried it in various low shady places without much success, we have now moved all of it to a well drained slope in semi-shade, between broad-leaved evergreen shrubs, and I hope this environment will suit it better.

A creeping evergreen with tiny leaves, very slightly variegated, is *Euonymus kewensis*. With me it has had a rather ragged growth; but I am now moving it about, and I feel that if only it can find its proper habitat, it will be very charming, and also fill a long felt want.

The heathers make delightful ground-covers, and *Calluna vulgaris* (both *alba* and *rubra*) have been most successful. Variety *nana* is the most beautiful but with me it is badly winter-damaged, and takes most of the summer to recover.

On walls, sempervivums have been a great institution and they spread quickly. It is never too hot or dry for them, and they are very hardy; their great variety and funny tall grotesque flowers make them a constant source of amusement.

Moss, too, is a beautiful substitute for lawn in the deep shade of a tree, and there are endless kinds, but it is hard to start in some places and needs at least two careful weedings during the summer.

This year, there suddenly appeared a fine growth of moss on a broad expanse of gravel in front of the Chinese Temple, and on inquiry as to

how this delightful effect could possibly have been attained, the gardener disclosed the fact that he had spread about weed-killer and then poured on molasses. The result was that a slight scum had been formed, which proved irresistible to the moss. Whether this will continue a second year and whether there will be more than one kind of moss remains to be seen; but of course this treatment could only be used in very special places. I once put molasses in the cracks of paving stones near the house and was nearly forced to leave home, on account of the immediate influx of horseflies, wasps and other objectionable creatures.

These are the ground-covers that so far we have found most useful, but there are countless varieties that I do not know, and many that I have not mentioned; such as arenaria, which grows so well between stones; the sedums and the saxifrages, and many native herbs that are close-growing; and some of these have the great advantage of being aromatic as well.

But beware of *Sedum dasyphyllum*, for though it is foolproof it grows like mad. We put it on a wall for the contrast of its light yellow-green, and almost at once it became the same color as the grass, and grew over everything in sight.

Also there are many different kinds of thyme; some very beautiful, and many, perhaps all of them, fragrant. One variety, which has become naturalized in New England, grows so profusely in Stockbridge that it does its best to drive out the grass in our lawns, and although it is greatly admired by some people, I personally do not like it mixed with the grass, as at the first sign of frost it dies a speedy death and all that is left is a great black splotch.

Then there is a whole world of plants that may be used as ground-covers, although they are generally treated as individual plants.

At Naumkeag, between two roads, there is an awkward triangle twenty to thirty feet across at its widest part, and it is filled tightly with yucca. The plants flourish and bloom with great masses of tall white flowers each July, with not a weed in sight; and to my certain knowledge they have not been touched, except to be thinned out, for at least thirty years.

In India, the much despised canna is used in the same way, and the great masses of red, yellow and pink flowers are brilliant and effective in that hot dry land.

Another very successful effect that we have had is the planting of red and purple petunias and annual white nicotiana so thickly around the base of tall shrubs that they form almost a solid bed in and out among the bushes; and they are not only a lovely combination when seen through the foliage of the shrubs, but they do well, and their delicious fragrance is wafted to the nearby terrace on every summer breeze.

At one time we had honeysuckle planted there, but even when killed down by winter in that severe climate it started up each spring with such renewed vigor that there was no holding it, and even so sturdy a plant as the native summersweet (*Clethra*) was smothered in its embrace. So out it had to come, and the petunias and nicotiana are a grand substitute.

Lilies-of-the-valley are good, and all the ferns and pinks (*Dianthus*), as well as *Veronica incana, Iberis sempervirens*; and many other every-day flower and foliage plants can be turned into ground-covers; but of course the fun is in trying something new; though it generally takes two or three years to prove whether a plant is going to be a success or a failure.

It must not be forgotten that in certain places and under certain conditions there are other materials than plants which can be used as ground-covers, and some of these are both useful and ornamental.

For formal designs, a good background can often be made of different shades and sizes of pebbles; of pounded brick; of crushed marble which comes in many colors; and even coal. Any of these are most decorative, gay and practical. They have the added advantage of being easy to change; and if at one time you have a pale pink or green background, and the next year you decide you would like it of red, black or white, all you have to do is to scrape off the old and put on the new, and thus escape bothering with changing soils or feeling that you are destroying some living thing.

In the beautiful Colonna gardens in Rome, there are two small spiral boxwood gardens at the base of a steep hill. After you climb this wooded height you look down and see these lovely curly-cue designs lying at your feet, the pattern standing out clearly, with great effect. This is due to the fact that the space between the dark rows of box is filled with brownish covering material, fading out into white at the points. This makes a sharp contrast with the green, which is very fine, and accentuates delightfully the spiral design.

What was my surprise on going down the hill and seeing the little gardens at close view to find that the flat surface between the hedges of low-clipped box was filled with nothing but different kinds of pebbles, stones, and bits of brick and coal —ending up in the narrow points with plenty of white that looked like bits of chalk. The result was splendid.

I do urge the use of ground-covers more and more, for they add greatly to the beauty of a place, and certainly they lower its maintenance. What is more, they are exciting to strangers who have not previously seen some particular kind of plant, or have not seen it used in just that way. And this gives delight as well as a great feeling of triumph to the struggling gardener.

HARDY FERNS FOR SHADED GARDENS

Widely distributed throughout the north, the first three are only occasionally seen either wild or in cultivation. The decorative Japanese variety below is one of the few ferns exhibiting variegation in its fronds.

1. *Asplenium viride*

2. *Dryopteris fragrans*

3. *Woodsia alpina*

4. *Athyrium Goeringianum pictum*

Two Serious Diseases Of Shade Trees

By B. O. Dodge

London Plane Tree Blight

AS early as 1935 reports came in from Delaware County, Pennsylvania, of a disease of the oriental plane tree which was killing trees at a rather rapid rate. More recently, reports have referred to the tree as the London plane, which is said to be a cross between the oriental plane (*Platanus orientalis*) and our American tree (*P. occidentalis*). This hybrid is now being called *P. acerifolia.*

Further reports from the U. S. Department of Agriculture now indicate that more than 1,000 trees in the vicinity of Baltimore have been killed by this disease besides more than 7,000 around Philadelphia and in nearby sections of New Jersey.

The first symptoms will be found on the trunks or large limbs, where cankers or shrunken areas appear on the old bark and brown streaks appear in the new bark beneath the cankers. In cross sections of the trunk these streaks show as radiating black lines which extend for some distance into the trunk. As the disease progresses its effects are noticeable by the thinning of the crown through loss of considerable foliage. Pirone of New Jersey has suggested[1] that the disease may spread through root grafts because one after another of the trees in a row appeared to succumb to the disease. Trees that are infected die within two or three years.

A predisposing factor of infection has been thought to be the cracking of the bark and the wounding of trees in pruning. In certain plantings 50 per cent of infections discovered have been found associated with pruning cuts. The disease has apparently been transmitted by pruning saws.

This plane-tree blight has been reported as far south as North Carolina, Virginia, and Mississippi, (Vicksburg), where the trees attacked have been identified as the American sycamore, *P. occidentalis,* thus proving that the disease is not confined to the London plane. So far it has not been found in the grounds of the New York Botanical Garden.

The fungus causing this blight has been identfiied as a species of *Ceratostomella.* Some have suggested that the species is similar to *C. fimbriata,* which causes a serious black-rot disease of sweet potato. *C. ulmi* is the species causing the destructive Dutch-elm disease. The plane-tree disease is being studied by representatives of the U. S. Department of Agriculture and of the departments of plant pathology in the agricultural experiment stations in Pennsylvania and New Jersey. Until more is known about the life history of the fungus and the methods of its transmission, those

[1] New Jersey Nursery Disease Notes **11**: 21-24. 1938.

persons in charge of city shade trees can naturally lessen the spread of the disease by using care in pruning and by applying protective tree paints over wounds.

Bleeding Canker of Maples

During the last year or two a great number of trees of the Norway maple (*Acer platanoides*) and other species of maple in Rhode Island, Massachusetts and New Jersey have been reported as dying from a new disease. Additional reports indicate that the same disease may be present on Long Island where a considerable number of trees are known to be dying from some trunk disease which presents similar symptoms. Caroselli and Howard, in an article in the Bartlett Tree Research Laboratories Bulletin (**3**: 44-48, 1939), described the symptoms as showing cankers in the bark of the trunk and large branches. The cankers extend vertically more than laterally. The disease also involves the sap-conducting tissues. Young trees with smooth bark show the disease as sunken areas which give the trunk a furrowed appearance. Through fissures which develop in the bark of cankered areas, sap oozes out and dries up to become the color of dried blood. The greater the rate of advance of the parasite, the greater is this flow of sap. It is for this reason that this disease has been called bleeding canker. The fungus causing it apparently enters the trees from the base and progresses upward, moving more slowly in slow-growing trees. The foliage of infected trees becomes thin and subnormal. In Norway maples there is a great deal of die-back from the top. Cross-sections of infected trunks show reddish brown decaying regions with olive-green margins in the sapwood. These discolorations can be traced down into the roots. Infected trees die as soon as the cankers completely encircle the trunk.

The fungus causing bleeding canker of maple has been identified as *Phytophthora cactorum*. Pirone of New Jersey reports[2] artificial infection of rhododendrons with this fungus. There are two well known diseases of rhododendrons caused by this and another species of *Phytophthora*. *P. cactorum* is known to cause a blight of flower buds and twigs which extends downward into the main stem. *P. cryptogea* causes root and basal trunk rot resulting in a wilt with subsequent dying of the plants. The parasite causing bleeding canker of maple appears to work more like that which causes this basal rot of rhododendron.

No one has yet suggested methods for control of this new maple disease. Anyone finding a maple tree during the coming summer that appears to be suffering from a disease which might suggest this bleeding canker of maple should report it to the New York Botanical Garden, or any other institution interested in the study and control of plant diseases, in order that steps may be taken to prevent the further spread of the trouble.

[2] Phytopathology **30**: 19. 1940.

A portion of the garden arrangement of Holland bulbs, which attracted unprecedented crowds to the Floral Display House in the Main Conservatories the latter half of March

A Greeting from Holland

The address given at the Garden March 17 by J. A. Schuurman, Consul-General of the Netherlands.

IT must be more than 300 years ago that the first tulips and hyacinths were imported into Holland from the Near East. Other bulbs and corms have since been introduced from various sources.

From a modest beginning the growing of bulbs has developed into one of Holland's leading industries.

Twenty-three thousand acres of land are now under cultivation, and, of tulips alone, we have more than 2,000 varieties. There is a reason why Holland should be the country to develop this industry. We have miles upon miles of a suitable soil, a natural mixture ot sand and peat. The ground water level is just at the right depth to draw the roots. And the seasons and weather conditions are perfect for growing hardy bulbs.

Moreover, in the course of centuries our nurserymen have accumulated considerable skill. Each variety is the result of careful experimentation. In the bulb country there is a special laboratory devoted to research work.

A corps of Government inspectors controls the quality and health of the bulbs both in the field and for export.

No shipment leaves the country without a certificate stating that the bulbs are full grown and free from disease.

Unfortunately the present war hit the industry very hard. Due to the closing of several markets it has been necessary to reduce the output of tulips, daffodils and hyacinths by 50% for the year 1940. There will be an ample supply for American consumption. And there will be left enough for domestic requirements.

Bulb Sunday in Holland

For bulbs are immensely popular in Holland itself. During a certain part of the year, especially the latter half of April, we live among our flowers. Young and old will go out, by every means of conveyance, into the bulb fields, to enjoy the marvelous spectacle. The roads are crowded with cars and bicycles bedecked with flowers. The trains and stations are veritable gardens. "Bulb Sunday" is

our great spring festival when everyone is gay and happy.

In the field of horticulture I see great similarities and great differences between our two countries.

Both in the United States and in Holland there is an army of scientific men, grappling daily with problems of physiology, taxonomy, ecology, pathology and the other branches of botanic science.

Both in Holland and in America there are large estates, public parks, and natural monuments.

But there also are great differences.

We do not have anything equal in size and importance to some of your institutions. We have not in Holland one botanic garden comparable to this magnificent Botanical Garden of New York.

But you in America do not have anything like the number of plant enthusiasts we have in Holland.

And you do not have, in private hands, anything like the variety of plants we have in Holland, free as we are to import from everywhere.

Walk through any of our cities, and almost from house to house you'll see the front yards or the windows full of plants and flowers, be they bulbs or shrubs, succulent or leafy plants. Even the poorest families, city dwellers or farmers, will have their share of the joy which plants can give.

The whole nation is plant conscious.

And in New York

Now you may say that this is just a matter of environment and that it cannot be done in New York.

It *can* be done in New York.

I am doing it now.

I have only been in New York for a few months; before that I lived in Canada, where I had eight acres of land, some wilderness, some grassy meadows, some barns, a rock garden, a pool, greenhouses and a library of botany books.

Then suddenly a telegram came: "Transferred to New York."

And everything went by the board.

Everything was lost, except the enthusiasm.

And now at my office in Rockefeller Center, I am again raising plants from seed, growing succulents and growing bulbs. Within the last few weeks I have flowered five or six species of bulbs of the more unusual kind.

And everyone who comes into my office says, "How lovely these windows look!"

The dryness of the atmosphere, and a few other drawbacks, are easy to overcome.

If you are the kind of man or woman who has green fingers, who will forego comfort, sleep or food, to take care of his treasures, there is no reason on earth why you should not grow plants in your homes or offices.

There is no reason on earth why every sunny window in New York City should not be adorned with plants, to the tremendous benefit of horticulture.

And bulbs are among the easiest plants to grow indoors.

One Gardener to Another

Now, in conclusion, let me say a few words as from one gardener to another.

You gardeners of the United States will understand the emotion which fills me when I refer to that great and mighty brotherhood of gardeners which exists all over the world.

Some of us are noblemen, others are workmen. Some are wealthy, others are poor.

But we all understand each other instinctively.

We all meet on common ground—the sense of beauty, which transcends all differences of race or creed, color or class.

War and strife may come over this world, but gardening will go on. Always and everywhere there will be faithful hands tending to the needs of those lovely beings which God, in His mercy, created.

I cannot think of a grander introduction than being a gardener. No matter where he goes, a gardener will find friends.

And so it is in Holland.

If any of you, gardeners of America, should come to Holland, we will be there, a hundred thousand strong, to take you into our yards, into our collections, into our homes and families and into our hearts.

Holland Bulbs Bring Crowds To Botanical Garden

THE DISPLAY of more than 8,000 Holland bulbs in bloom among other indoor flowers of early spring brought not less than 12,000 visitors to the Main Conservatories at the New York Botanical Garden on March 17. The day had

INTERBOROUGH RAPID TRANSIT COMPANY

"L" INTERBOROUGH

The Elevated Express

RIDE ON THE OPEN AIR ELEVATED

VOL. XII No. 10 — THOMAS E. MURRAY — *Receiver* — 1940

EASTER DISPLAY
in the conservatories
SEE NEW YORK FIRST
NEW YORK BOTANICAL GARDENS
Beginning March 17
Take East Side Els to Bronx Park sta.
or Subway to 149th St. and change to El
FREE
FRED COOPER

The Marchbanks Press, New York

The poster provided by the Interboro Rapid Transit Company in New York and placed in the windows of all their subway and elevated trains, thereby influencing many thousands of persons to visit the Easter display in the Main Conservatories.

been designated as the Garden's Festival of Spring Flowering Bulbs. It was in addition Palm Sunday and St. Patrick's day, and a day of exceptionally favorable weather after a heavy snow on Saturday.

The flowers on special display represented part of the gift of 47,400 bulbs received last fall from the Holland Bulb Industry of Haarlem, Holland. A few had already been brought into bloom in the conservatories. The balance—about 35,000—will be seen outdoors between the third week in April and the third week in May, some in the conservatory court, others bordering the path which leads from the Elevated station, and some at the south end of the Thompson Memorial Rock Garden.

In recognition of this gift from Holland and in anticipation of spring, the Garden presented a program in the Museum Building the afternoon of March 17 for which more than 700 people packed the lecture hall. After a brief introduction by Dr. William J. Robbins, Director, in which he compared the spring festivals of the ancients with those of today, Miss Margaret Herbst of the Holland Bulb Industry gave a prospectus of Holland bulb displays to be seen in America this spring.

Mr. J. A. Schuurman, Consul-General of the Netherlands, then spoke, addressing his audience both as a diplomat and as a gardener speaking to other lovers of flowers.

There followed a motion picture in technicolor, with a musical background, showing the garden of Mr. John W. Sherwood of Baltimore. In a rapid panorama 80,000 tulips were shown, with additional thousands of azaleas, flowering dogwoods, and other flowers of spring, and views of one of the country's finest collections of boxwood. The garden has been planned for an abundance of bloom in May and is open to the public throughout that month. The motion picture was provided for the Botanical Garden's program through the personal courtesy of Mr. Sherwood.

Part of the Garden's naturalistic arrangement of hardy ferns in 142 species and varieties, which won a gold medal and a special prize at the International Flower Show.

For the second half of the program Mr. George H. Gillies, head gardener for the Marshall Field estate at Huntington, Long Island, gave a lecture on the cultivation of Holland bulbs. The Main Conservatories were held open more than an hour after the usual closing time.

Throughout the following week unprecedented crowds continued to throng the conservatories, three or four thousand people visiting there daily. On Easter Sunday, which was one of the coldest days of the year, waiting crowds made it necessary to open the doors at 20 minutes of 10, and a steady stream of visitors filed through the display houses until 6 o'clock. More than 9,000 entered the door of the Floral Display House alone, so it is estimated that around 14,000 persons saw the Easter display. More than 1,400 automobiles entered the main gate. With all these crowds, not one flower in the entire display was damaged.

Ice Storm Takes Heavy Toll

THE ice storm of March 4 and 5, which for two days kept every branch and twig surrounded with a heavy jacket of ice, resulted in more damage at the New York Botanical Garden than was experienced in the 1938 hurricane. It was, in fact, the most devastating storm in the history of the Garden.

In the hemlock forest and other woodland areas alone, 200 good-sized trees have had to be removed. In the cultivated areas, the damage to 25 additional large trees necessitates their removal. More than 700 others were so badly injured that they require heavy pruning and many of them cabling, while hundreds of smaller trees must be staked and wired if they are to be saved.

Poplars, willows, elms, lindens, maples, gums, and plane trees were the most severely injured. It is believed that the elms, because of their ready ability to throw out new shoots, will be the first to recover—that is, to resume a normal shape. Ginkgos and horsechestnuts withstood the weight of the ice with the least damage, and the two double rows of tulip trees leading to the Museum Building also escaped serious breaking.

Nearly all the large specimens of birch were badly damaged, and many will be one-sided or have large openings in their crowns. Among the oaks, one specimen each of *Quercus lyrata*, *Q. Robur concordia*, *Q. Robur fastigiata*, and *Q. Muhlenbergii*, two of *Q. serrata* and three of *Q. Robur* were damaged. In the magnolia collection the most serious injury

was suffered by three specimens of *Magnolia Kobus,* two of *M. Soulangeana Alexandrina,* and one each of *M. denudata* and *M. acuminata.* One specimen of *Catalpa ovata* may not recover, and one of *Gleditsia triacanthos* lost half its crown. Ascending branches of *Sophora japonica* were broken in many instances, and most of the persimmons were injured at the top. The heavily branched, contorted tree, *Salix Matsudana tortuosa,* was broken in so many places that little was left of it.

Among the conifers the most notable damage occurred on three specimens of *Pinus Thunbergii* facing the Advisory Council border; two of *Pinus Bungeana,* whose leaders were broken in two; and several white pines (*P. Strobus*) which lost branches on the north side from the weight of the ice. Spruces and firs suffered little damage, but 14 arborvitaes and junipers required removal and about 200 more are being staked and wired to return them to upright positions.

Outside of the actual loss of the trees, great damage from the ice storm may yet occur, when insect pests and fungous diseases enter the trees by way of the open wounds where branches have been broken. Prompt pruning and painting of the cut surfaces is necessary—and so far as the Garden's labor facilities permit, is being done—to reduce this double threat to the remaining trees.

Gold Medal and Special Prize Awarded for Fern Exhibit

THE COLLECTION of 142 varieties of hardy ferns which the New York Botanical Garden exhibited last month at the International Flower Show in New York was awarded a gold medal and a special prize.

The ferns were displayed in a naturalistic setting, with a woodland background of birch trees and mountain-laurel, and a small stream dripping over a ledge of rock and running across the foreground to give an appropriate site to the moisture-loving species. Large labels placed high above the exhibit described the cultivation of ferns and explained

Phyllitis Scolopendrium, the hartstongue fern, grown from material provided by T. A. Weston—one of the outstanding ferns in the Garden's display at the Flower Show.

their life history briefly. Individual labels gave the botanical name and origin of each species. On a table adjoining the exhibit, different methods of propagation of ferns by spores were demonstrated.* Also shown were examples of fossil ferns believed to be about 340,000,000 years old.

Notes, News, and Comment

Yale. Dr. Edmund W. Sinnott, Professor of Botany at Columbia, will go to Yale University next July as Sterling Professor of Botany, Chairman of the Department of Botany, and Director of the Marsh Botanical Gardens there. Since 1933 he has been on the Board of Managers of the New York Botanical Garden, appointed to represent Columbia University, and since 1934 he has been a member of the Corporation of the Botanical Garden. He was one of the Scientific Directors from 1930 to 1933.

Conferences. Dr. William J. Bonisteel, Professor of Botany and Pharmacognosy at Fordham University, addressed the monthly conference of the scientific staff and registered students at the Botanical Garden March 15 on "Flower Behavior in Certain Species of *Aconitum*." Thomas Laskaris, fellowship student of the American Delphinium Society, gave a progress report on his studies of crown rots and virus diseases of *Delphinium*.

On February 16, Prof. K. C. Hamner of the University of Chicago spoke on "The Interaction of Light and Darkness in Photoperiodic Response" and J. D. Dwyer, graduate student at Fordham, spoke on "The Ochnaceae of America." Professor Hamner came to the Botanical Garden Jan. 15 to spend several weeks studying the technique of sterile culture of fungi and root-tips, under the direction of Dr. William J. Robbins.

At the January conference, members of the staff who attended the December meetings of the A.A.A.S. gave reports.

Sigma Xi. Clyde Chandler, Frederick W. Kavanagh, and Ellys T. Butler were elected last month to membership in Sigma Xi, honorary scientific fraternity, by the Columbia University chapter. All have been preparing for their Ph.D. degrees at the New York Botanical Garden, the first two serving as members of the staff.

Argentina. Leon Grodsinsky of Buenos Aires, a member of the staff of the Division of Phytopathology of the Federal Ministry of Agriculture, is spending two months at the New York Botanical Garden, working in Dr. Robbins' laboratory to familiarize himself with growth substances in relation to plants.

Mrs. George B. de Long. The Corporation of the Garden lost a member in the death on Feb. 28 of Mrs. George B. de Long. She had been elected to the Corporation in January 1938.

Garden Book Week. Books on gardening that have appeared during the past 12 months are being emphasized in the library display for Garden Book Week April 1-6. The display will be continued throughout the month on the circular table in the library in the Museum Building.

Contest. Elizabeth C. Hall has been appointed one of three judges for a Garden Book contest announced by Macmillan April 1 to encourage new writers in the field of gardening.

Counselor. Dr. William J. Robbins has been appointed Honorary Counselor of the 1940 California Spring Garden Show in Berkeley.

Groups. Among the student visitors to the New York Botanical Garden in recent weeks were a class in horticulture from Columbia University March 8 and a group from Adelphi Academy in Brooklyn two weeks earlier. On Washington's Birthday six Girl Scout leaders from White Plains studied the exhibits of local flora and cryptogams in the Museum Building and also visited the Main Conservatories.

Meetings. Fifteen members of the Hiking Club of New York attended the Saturday lecture at the Garden on Feb. 3. The following afternoon the Local Flora Committee of the Torrey Botanical Club met in the museum building.

Lectures. "Recent Observations on Growth of Excised Tomato Roots" was the subject of Dr. William J. Robbins at Colloquium in the Botany Department at Columbia University March 12. Dr. W. H. Camp recently gave two lectures on

* An outline of these methods will be given in a forthcoming number of this Journal.

his explorations in southern Mexico, one before the Worcester Horticultural Society Feb. 8 and one before the Riverdale-on-Hudson Garden Club March 13. Dr. H. N. Moldenke spoke before the Torrey Botanical Club March 6 on "A Naturalist in Florida." At the Torrey Club meeting and tea at the Botanical Garden March 20, Dr. Edmund W. Sinnott talked on "Some Problems of Cell Behavior in Plant Development."

In addition, Cleveland Garden Center heard an illustrated lecture on Begonias by T. H. Everett Feb. 20. On Feb. 15 Mr. Everett spoke before the Dutchess County Horticultural Society in Poughkeepsie, covering nearly a hundred subjects in a lecture entitled "Plant Portraits." On Feb. 13 he addressed the Stamford Garden Club on "The Principles and Practices of Good Gardening."

"The Gardener's Library" was the subject of Elizabeth C. Hall before the Bedford Garden Club Feb. 6. On Feb. 14 she spoke on "A Day at the Botanical Garden" before the Women's Club of Broadway Tabernacle Church.

Visitors. Frans Verdoorn, bryologist, and editor of *Chronica Botanica* and other publications, whose headquarters have recently been removed from Holland to the United States, visited the New York Botanical Garden Feb. 2. Among others who have registered in the library since the first of the year are David R. Sumstine of the Carnegie Museum in Pittsburgh; F. W. Went, California Institute of Technology; Juliette M. Oliveira, Experiment Station, Honolulu; E. D. Merrill, Arnold Arboretum; Elizabeth T. Blossom, Massachusetts Horticultural Society; Edgar T. Wherry, University of Pennsylvania; H. K. Svenson, Brooklyn Botanic Garden; Leo Havis, Ohio Experiment Station; Dow V. Baxter, Ann Arbor, Mich.; Harold St. John, New Haven, Conn.; Maxine Larisey, Wellesley College; L. G. Brass, Brisbane, Australia; and M. A. Chrysler, New Brunswick, N. J.

March visitors at the Garden included Dr. Louis O. Williams of the Harvard Botanical Museum at Cambridge and Dr. E. N. Transeau, Chairman of the Department of Botany at Ohio State University and President of the Botanical Society of America.

Student Gardeners. Ronald Townsend, who was graduated a year ago from the Science Course for Professional Gardeners, left the Botanical Garden April 1 to become superintendent of the estate of Edgar B. Stern in New Orleans. Mr. Stern is a newly elected member of the Corporation of the New York Botanical Garden.

Philip Spear was appointed an assistant to Dr. B. O. Dodge in disease and pest control, beginning his new duties March 1. He is a former student gardener.

Donald J. Moss, a graduate of the Science Course in April 1939, and since then employed at the Garden, went to Concord, N. H., March 15 to become Supervisor at the Concord Resident Center of the National Youth Administration.

Authors. Victor Wolfgang von Hagen, who writes about "Achiote, the Blood Tree" in this issue, is a Middle Westerner who, with his botanist wife, has traveled far into previously unexplored regions of the Americas. He is the author of several books of exploration, including "Off With Their Heads" (Macmillan), "Quetzal Quest" (Harcourt, Brace), and "Ecuador the Unknown" (Oxford University Press), in which he devotes several chapters to the "Colorados" described here. Last winter he lectured at the Garden on "Culture and Agriculture of the Mayas" and has promised to speak again on his return from his present expedition.

Miss Mabel Choate, who recounts her experiences with substituting ground-covers for grass on her country estate in Massachusetts, is a New York woman who has been associated with the New York Botanical Garden for a number of years. She was elected to the Corporation of the Garden in 1933.

Passion-Flower. The passion-flower vine, which has climbed to the top of the 60-foot dome and part way down again in the Tropical Flower Garden, came into full bloom during the Easter season. One of its flowers is shown on the cover this month. A descriptive label and a fresh flower placed each day in a dish of water near the vine caused many thousands of persons to give the plant their attention.

The early Italian and Spanish explorers, discovering *Passiflora caerulea* in South America, declared it to be symbolic of the passion of Christ. Hence its

botanical name. The ten petals and sepals were thought to represent the ten apostles present at the crucifixion, Peter and Judas being absent. Inside the corolla is a showy crown of colored filaments or fringes emblematic of Christ's crown beset with 72 thorns. The five stamens are suggestive of the hammers which were used to drive the three nails —the stigmas—shown in the center. The long coiling tendrils of the vine represent the scourges.

An early description read: "The passion-flower (*Passiflora caerulea*) is a wild flower of the South American forests, and it is said that the Spaniards, when they first saw the lovely bloom of this plant, as it hung in rich festoons from the branches of the forest trees, regarded the magnificent blossoms as a token that the Indians should be converted to Christianity, as they saw in its several parts the emblems of the Passion of our Lord."

Turf Conference. Dr. B. O. Dodge took part in the educational program of the 1940 Turf Conference and Equipment Show in New York on February 8 during the symposium on "Fairway Renovation and Maintenance." The conference, scheduled for February 6-9, was sponsored by the Greenkeeping Superintendents Association.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Handbook for Foresters And Ecologists

APPLIED SILVICULTURE IN THE UNITED STATES. R. H. Westveld. 567 pages, 99 figures, bibliographies, index. John Wiley & Sons, New York and London. 1939. $5.

This is a practical handbook for the practising silviculturist, which also is valuable as a text and reference book. The material is grouped in eighteen chapters, each of which treats of a forest region of the United States. The adequacy of the coverage of silvicultural problems may be indicated by mention of the organization of the chapters. The principal topics in the chapter on the Northeast Spruce-Hardwood Region are: description (location and land ownership, physiographic features, climatic features); history (development of lumbering, effect of past practices); the forests and their management (spruce-fir types, northern hardwood types, aspen and paper birch types); references. Under spruce-fir types, above, we find the following sub-topics: cutting and planting (ecological basis, economic basis, application of methods); slash disposal (slash in relation to fire, ecological effects of slash, economic considerations, methods); disease and insect problems (ecological basis, control); control of animal and logging damage. Under the topic of "the ecological basis for cutting and planting" we find the following topics: composition and character of the forest; stand regeneration and development (general principles, effect of competition, responses to release, red spruce type, yellow birch-red spruce, and red spruce-sugar maple-beech types); windfall.

Each forest region is treated with the same detail as that described for chapter one. It is obvious that Professor Westveld has done a tremendous amount of organizing and condensing to bring this work within the scope of 567 pages. His Applied Silviculture will undoubtedly become a standard handbook for foresters. It will be almost as useful to ecologists and other students of forest vegetation.

STANLEY A. CAIN,
The University of Tennessee.

Forestry in the Southeast

A GUIDE TO FORESTRY ACTIVITIES in North Carolina, South Carolina, and Tennessee. Edited by William Maughan. 287 pages, including a bibliography. Illustrated with maps and charts. Appalachian Section, Society of American Foresters, January, 1939. $1.50.

The contents of this book are ample proof of the extensiveness of forestry activities, and particularly of the rapid

expansion of such activities during the past few years in the three states covered by the guide. The volume was compiled from summary descriptions of forestry activities solicited from the agencies concerned; the result indicates excellent condensation of material which must have been far too voluminous for publication in a single volume.

The compilation covers the work of five forestry agencies of the U. S. Department of Agriculture, namely, the Forest Service, Soil Conservation Service, Bureau of Agricultural Economics (Land Utilization Division), Bureau of Entomology and Plant Quarantine (Division of Plant Disease Control), and the Bureau of Plant Industry (Division of Forest Pathology). The forestry activities of the U. S. Department of the Interior include the National Park Service and the Office of Indian Affairs. The forestry work of independent Federal agencies includes the Civilian Conservation Corps and the Tennessee Valley Authority (Department of Forestry Relations). The work of the State forestry organization for each of the three states is also presented, as are the work in farm forestry extension and the forestry activities at five educational institutions. Under Forestry by Private Interests are included estate forestry and the work of the Farmers Federation, two railroads, and ten pulpwood companies.

A considerable portion of the three states has been photographically mapped from the air, and a short chapter is devoted to a discussion of these maps and their availability.

A selected 21-page bibliography lists publications and articles dealing with forests and forestry in North Carolina, South Carolina, and Tennessee.

This volume can serve as an excellent guidebook, not only to foresters but to anyone interested in forestry activities who may be contemplating a visit to any of these three states.

ERNST J. SCHREINER,
Northeastern Forest Experiment Station, New Haven, Conn.

Landscaping with Woody Plants

TREES AND SHRUBS FOR LANDSCAPE EFFECTS. Marion Cruger Coffin. 169 pages, illustrated, indexed. Scribner, New York, 1940. $3.

It is a refreshing experience nowadays to pick up another garden book and, having read but a little way, to prick up one's ears and sense the manner of mastery; and then to go on, enjoying so skillful a presentation as this, of all manner of woody plants and their landscape uses.

This job is ably compacted within a volume of modest proportions, restricted to pertinent matter—yet pleasant and interesting to read. The scope is well defined. It does not take in practical gardening or propagation, but deals with the plant element in landscape composition. It takes the reader beyond the limits of the more commonly known trees and shrubs and illustrates the greater freedom of expression that comes from acquaintance with a wider range of materials. This is done in the easy manner of one thoroughly familiar with and practiced in the field. The book runs as smooth as a clock. Here is an original and able contribution, without the slightest flavor of rehash,—useful and delightful. It should be of particular value to people with places somewhat beyond average suburban dimensions.

From the viewpoint of the professional plantsman the following critical remarks are offered.

Probably few amateurs will, but plantsmen may, be a little shocked to note that species are freely spoken of in this book as "varieties." Expressions like "the common variety, *Syringa vulgaris*" and "the variety *Euonymus Bungeanus*" (pp. 37 and 80) are rough spots, more easily passed over in books of lesser quality than this.

The reviewer, living in the Hudson Valley, could have wished for a little more precise definition of the geographical scope of the book, especially as to its reach inland. One wonders a little how far inland some of the materials—such as the evergreen barberries—can be trusted.

On p. 127 a distinction is made between *Taxus cuspidata capitata* and the "true" *T. cuspidata*. That seems hardly right. The "*capitata*" form is the truer, more typical growth-form of the species, and the spreading form, probably meant by the "true" kind, is only a peculiar habit-form resulting from lateral cuttings. The varietal name *capitata* has no standing at all. One might better speak simply of the upright and the spreading Japanese yew. Nor is "*Taxus brevifolia*" on p. 127 right. The plant here meant is probably not *T. brevifolia*, the western yew, but *T. cus-*

pidata nana, the dwarf Japanese yew. In fact, the nomenclature, throughout, might well have been brought more nearly abreast of Rehder's Manual.

Such things as these do not materially detract from the inspirational value of the book to the amateur gardener. But they do, frankly, affect its quality from the plantsman's viewpoint.

P. J. VAN MELLE.

A Botanical Text for Future Teachers

AN INTRODUCTION TO BOTANY. J. H. Priestley and Lorna I. Scott. 615 pages, 170 text figures, index. Longmans, Green & Co., New York and London. 1938. $6.

This is a text which is rather different from most American texts and invaluable as a reference for botanical information and for ideas on demonstrations, but it is very doubtful if one could use it successfully as a text in this country with our system of mass education. This book was written as an introductory text at the University of Leeds where the majority of students are vitally interested in the subject, and where the majority of them will later become teachers. As a result this book is detailed and comprehensive and too complicated for the average student in our colleges.

Priestley's text has a great many features to recommend it. It is clearly written in good English and illustrated with drawings and photographs which are original. The arrangement of the subject matter allows the student to have much preliminary training in careful observations and descriptions before he encounters the microscope. The study commences with the seed, progressing to the seedling and on to the formation of the adult vegetative shoot. After several other chapters on herbaceous plants, woody plants, buds and leaves, the microscope is introduced as a tool to aid further understanding. Special methods are designed to encourage the student to visualize the images seen in the microscope as three-dimensional objects. This is one text that gives the student important facts concerning the proper use of the microscope and the reasons to explain how it works.

Much significance is attached to development in interpreting features of form and structure, and most interpretations are made with special reference to the flowering plant. The lower forms are very briefly presented.

The portion devoted to physiology is not so strongly developed as that part concerned with structure, but what is given is good, and would necessitate several courses in organic chemistry for the average student to understand. Genetics, reproduction, and the biology of the flower and fruit are discussed near the close of the text. A final chapter on classification is well done. A good index is furnished, but no bibliography is to be found.

ERNST NAYLOR,
University of Missouri.

Three Science Texts

GENERAL SCIENCE. J. C. Platt, Freda Jones, W. C. Frid and J. H. Hopkinson. 167 pages, illustrated and indexed. Chemical Publishing Co., New York, 1938. $1.50.

Mainly a series of experiments illustrating general biology, with excursions into physics and chemistry; contains more inaccuracies than needful even in so elementary a work.

BIOLOGICAL LABORATORY TECHNIQUE. J. Bronte Gatenby. 130 pages. Index. Chemical Publishing Co., New York, 1937. $3.

Directions and formulae for fixing, sectioning, staining, smear preparations, etc. The book should be useful to zoologists. The most serious omission is a good discussion of microscopy.

BIOLOGICAL DRAWINGS with notes. Second edition. Maud Jepson. 60 pages of illustrations, indexed. Chemical Publishing Co., New York, 1939. $2.

Labeled drawings, keys, and notes, intended to obviate drawing, etc., by students. Aside from the questionable pedagogy involved, the book abounds in errors.

H. W. RICKETT.

THE NEW YORK BOTANICAL GARDEN

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by complete descriptions and other pertinent information.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays at the Garden from season to season.

(5) Credit, to the extent of the membership fee paid, toward courses of study offered by the Garden.

A limited number of Garden clubs are accepted as Affiliates. The privileges of affiliation are one lecture a year by a member of the staff, a share in the distribution of plants when they are available, a subscription to the Journal and to Addisonia, and announcements of special activities at the Botanical Garden. In addition, any member of an affiliated club may enroll in the Garden's study courses for one-half the regular fee.

Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

The classes of membership and types of benefaction are as follows:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Affiliation	annual fee for club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

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CAROL H. WOODWARD, Editor
May 1940

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By Courtesy of the Netherlands Railways
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WILD FLOWERS

The program being given at the New York Botanical Garden May 9 to honor the memory of Elizabeth G. Britton emphasizes one of the early activities of the Botanical Garden: the culture and protection of native American wild flowers and the dissemination of information about them.

When the Garden was in its infancy early in the century, the movement for the preservation of wild flowers was also just beginning, and Mrs. Britton took an active part in this new organization.

Eventually, the work that she did with such conscientiousness was taken over by the Wild Flower Preservation Society, with national headquarters in Washington, D. C., and the New York Botanical Garden continued its phase of the work from a different angle. Articles on native plants appear in the Journal from time to time. In the Hemlock Forest and other natural woodlands at the Garden, there are hundreds of people every spring who search for a sight of the first Dutchman's breeches, violets, hepaticas, and bloodroots. None may pick these flowers, but all may seek and enjoy them there. Boy and Girl Scouts, hiking clubs, classes from grade and high schools, and members of courses offered by the Botanical Garden study the native plants in these areas and learn about their protection.

A few years ago, the Botanical Garden started a modest Wild Flower Garden in the southern part of the enclosure which contains the Thompson Memorial Rock Garden. The Elizabeth Gertrude Knight Britton Fund for the Preservation of Wild Flowers, being presented by the New York Bird and Tree Club, will help the Garden to continue with renewed enthusiasm the work begun so long ago by the wife of the first Director, offering, through the cultivation of wild flowers, education in their protection.

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Tulips In The Netherlands Yesterday And Today

By Margaret Herbst
Holland Bulb Industry of Haarlem, Holland

IT is perhaps inconceivable that the peaceful-looking tulip should have had a turbulent past, yet its development has made exciting history.

In 1554, the first tulips were sent or brought from Asia Minor as a gift to friends in Vienna by Busbequius, the Austrian Ambassador to Turkey. He had glimpsed their beauty in a garden near Constantinople and had paid a very high price for them. We find evidence of their oriental origin in the botanical name *Tulipa*, a word traceable to Turkish and Persian, meaning "turban" and adopted because of the resemblance of the inverted tulip flower to that type of oriental headdress.

It did not take long for tulip gardens to become the fashion in central Europe, but in the early days of the mid-sixteenth century, these stately flowers were featured only in the gardens of the nobility and the wealthy merchants. It is said that the Duke of Cleve had men-at-arms stationed around his grounds at flowering time. The botanist Clusius, who engaged in propagation on a large scale, charged such extravagant prices that envious neighbors stole the finest varieties from the garden which he maintained in Leyden.

From this time on (about 1590), trading increased rapidly until it ceased to be legitimate; a craze for gambling in tulip bulbs swept Europe like a stockmarket mania. One immature bulb of ***Admiral Liefken*** weighing less than a grain was valued at 4,400 florins (approximately $1750), while ***Viceroy*** of the same weight sold for 3,000 florins. The highest price ever paid for a single bulb of ***Semper Augustus*** totaled about $2,000, plus a coach and four white horses complete with harnesses. There were

only two bulbs of this variety in Holland at that time, one in Amsterdam and one in Haarlem.

Alexander Dumas in his book called "La Tulipe Noire" told how the people flocked to see the beds and storehouses of growers as they would a museum; how the tulip was almost worshipped during that period and given special preference in the garden.

The tulip mania, or era of reckless gambling in tulip bulbs, lasted from 1634 to 1637, and it involved many noblemen, merchants and soldiers. Finally, the Government of Holland issued a proclamation putting an end to these practices, but not before thousands of people had lost their entire fortunes in the fluctuations of the market.

Despite all this frenzy, tulip fanciers lost none of their enthusiasm, so that shortly thereafter we find a regular trade developing in tulip bulbs for use in gardens; later, the narcissi, hyacinths, and other bulbs were added to the lists of the 17th century bulb-merchants.

When one sees pictures of the first tulips, most of which were striped (of the Rembrandt class), it is hard to believe that gradually from these, through long and difficult hybridizing, the present forms have originated, offering to the public a choice of thousands of varieties, in endless color variations.

Twenty Thousand Acres of Bulbs

Bulb planting is no small matter in Holland, and the country devotes about 20,000 acres of her land to the production of flowering bulbs. New varieties of tulips can be very expensive and a bed of some rare type may well cost a thousand florins. It is a form of sober investment, however, unlike the wild speculation of three or four centuries ago, when men would barter all their possessions for a single bulb. Only one or two varieties remain from that mad time, but ever since then Haarlem has been the center of the bulb fields, which extend for 18 miles southward to Leyden.

Thus the Holland bulb industry has become the second largest industry of that country, giving work to many people. Agriculture, including dairying, ranks first. The immense crop is yearly shipped all over the world. War or no war, people will still look forward every spring to the blaze of beauty bursting from Holland bulbs in practically every corner of the temperate zone the world around.

All the bulbs in Holland are planted by hand in the fall in long carefully prepared beds, each containing a number of short rows. The beds are separated by narrow paths, which are used in the spring for daily inspection. The same type of soil occurs to a depth of hundreds of feet and no sign of rock is ever found anywhere. The canals along the fields provide a constant water level thirty inches below the planted bulbs and

this water level can be maintained throughout the year, regardless of an especially dry or rainy season.

After planting, all bulb fields are covered with a thick layer of straw or reeds for winter protection, to be taken off again in the spring preparatory to flowering time.

Every season, a special day called Tulip Sunday is set aside and the bulb fields then are visited by thousands of people, most of them on bicycles, all decorated with garlands of flowers strung together in many colors. This event usually takes place on the second Sunday in April, or if possible on Easter Sunday. The fields are thrilling to behold then, resembling a huge carpet with geometrical patterns in brilliant colors extending for miles.

Within a short time these fields are all deprived of their great beauty, for the millions of blossoms must be cut soon after flowering. The stems are left, the blossoms being snipped off close to the top, so that all the strength may go in the bulbs at the time they mature. None of the flowers are sold. They are all destroyed as this is the only way to avoid unfair competition with the dealers who have bought the bulbs in the previous fall for the purpose of selling their flowers later.

Digging and harvesting are done in June or July. The bulbs are carried to specially designed sheds and storehouses, equipped with up-to-date heating systems, where they are dried.

After the bulbs have been taken from the fields, the land has to rest for three years before another crop of the same kind can be grown on the site. By growing hyacinths, tulips, and narcissi or crocuses in rotation, a different crop can be obtained from the same soil each year. Sometimes it is necessary to trench the bulb land from two to five feet deep, in order to get fresh soil on top again.

Insuring Perfect Bulbs

The laboratory work in connection with the bulb industry represents a continual warfare against insect pests and bulb diseases, and is a feature of the industry of which the whole Dutch nation is justly proud. Everything possible is done to insure that bulbs leaving the shores shall be sound, healthy, and well ripened. Holland has, of course, ideal climatic and soil conditions for the production of good bulbs, and when one adds to this the knowledge that has resulted from years of patient enterprise and research, one understands why it is that the Holland bulbs have attained their enviable reputation.

After they have been thoroughly treated to insure the best flowering results and graded for export, they are sometimes placed in cold storage, where the lower temperature will develop a capacity for earlier flowering, necessary for advanced forcing in the greenhouses. As early as Christmas time the first flowers thus will bring the ever-returning promise of spring.

Photograph by Margaret McKenny

Ebony spleenwort growing in its favorite spot—crevices and soil pockets in rocks.

Forcing Ferns For Display

THE selection and planting of a collection of ferns outdoors in a rock garden or fernery is in itself a problem, but the forcing of a collection of hardy ferns for exhibition purposes is quite another story, complicated by numerous physiological factors as well as by the ordinary cultural difficulties peculiar to greenhouse crops. The time element also is an uncertainty whenever material is being grown for exhibition on a certain date. Mr. Tansey, who is Greenhouse Foreman at the New York Botanical Garden, tells here how the Garden's 142 varieties of ferns were forced for display at the International Flower Show in New York City in March.

By Joseph W. Tansey

FERNS that are hardy within the vicinity of New York go through a dormant or semi-dormant period during the winter. This is natural to some species which, as summer nears its end and fall approaches, prepare themselves for the rigors of winter. Other kinds are more determined, continuing their growth until they are struck down by cold temperatures. The evergreen species, although impeded by cold weather, continue their functions throughout the winter or at least until blanketed by snow. It is this dormant period that plays such an important role in the forcing of ferns.

The ferns used by the New York Botanical Garden in its exhibit at the International Flower Show in March 1940 were for the most part received during the fall of 1939. Of these a portion were collected by ourselves and the remainder were sent in by collectors or as contributions from private growers or from commercial dealers in ferns. A good many were shipped long distances and consequently suffered from being packed so long.

When we ourselves collected some of the ferns for the display, we took pains to select only the largest and most vigorous clumps obtainable. It was evident that without exception these produced the best plants, producing more fronds and attaining a greater size.

Potting the Plants

The question of potting ferns was solved by classifying them according to the type of soil required. It was our aim to duplicate their natural soil conditions so far as reasonably possible. First we segregated the lime-loving ferns. To their soil mixture, though it was basically leafy, we added a quantity of finely broken lime rubble. The acid-loving ferns also received a compost largely of leafmold, and this was varied according to the species, ranging from a heavy coarse leafy mixture for the larger types to a more finely screened humusy type for the smaller ferns. Broken crock and charcoal were added to the mixtures wherever it was deemed necessary to keep the mixture sweet and open though acid in reaction.

No fertilizer was used or warranted as very few new roots were made and the ferns in no way showed signs of insufficient nutrients.

The operation of potting varied according to the nature of the ferns. Except where flats or pans were made up with more than one plant, the smallest possible receptacle was used. This was not for the purpose of economy of space but rather because under growing conditions the compost will remain in better physical condition if this relation between pot and plant is maintained. The great majority of such ferns as *Dryopteris, Polystichum, Phyllitis,* and others which consist of distinct clumps, were treated in this fashion. Those with decidedly creeping rootstocks, such as the hayscented fern (*Dennstaedtia punctilobula*), had to be twisted around in the pot to get in as many as possible so as to make a reasonable show. The smaller ferns, such as *Dryopteris fragrans, Asplenium viride,* and others, were quite successfully grown when grouped together in pans. This was done in a naturalistic fashion but on a miniature scale, using stones and plants as we might expect to find them in the wild. The walking fern (*Camptosorus rhizophyllus*) was planted in flats and large pans so that the tips of the fronds might be on the soil and give rise to new plants as they would in their natural habitat. Though extra care was necessary in watering these, it was on the whole quite a satisfactory method as the plants grew luxuriantly and produced a number of young plants from the apex of the fronds.

The Problem of Storing

The theory of treating ferns in as naturalistic a fashion as practical again presented itself in the methods of storing until time of forcing. Three methods were considered: (1) to store them all in a cool damp greenhouse in the hope they would develop roots and, in the case of the evergreen ferns, maintain their fronds in good condition; (2) to store them all outdoors in a frame and allow them to go into their dormancy in much their natural fashion; or (3) to combine these two methods by placing all outdoors except the evergreen types. Of the three methods the second was chosen and all the ferns were plunged outdoors in a frame. They were shaded and watered as required until frozen in and winter had definitely taken its hold. At this time a thin covering of leaves was thrown in to protect them from the sun, and sash was applied to prevent further freezing. It is believed this additional protection is justified inasmuch as the ferns being unestablished might have been killed by repeated severe freezings.

It wasn't until the turn of the year that the matter of forcing the ferns took on a more serious aspect. During the first week of January all the ferns except the three species of *Osmunda* were brought into a 45° house and allowed to remain while the forcing house was made ready. This, to say the least, was an arduous task as the whole inside of the house was

WESTERN FERNS

FOR EASTERN GROWERS

Here are three choice species from California and Oregon worthy of a trial in gardens away from their native habitat.

1. *Pellaea andromedaefolia*

2. *Pellaea mucronata*

3. *Pityrogramma triangularis*

washed with kerosene and soap. The soil beneath the benches as well as the cinders on the benches was thoroughly disinfected to kill all possible insects. Though these measures might seem unwarranted it was nevertheless gratifying to know the plants were free from the devastating injuries that can be caused by slugs and roaches that sometimes inhabit tropical houses.

In the Forcing House

By the close of the second week the great majority of the ferns were placed in the forcing house with the exception of the Osmundas, which were then brought into the coolhouse. These also were moved into the forcing house the following week and carried along at a night temperature of 55 degrees.

Early development was slow and, needless to say, discouraging. By the first of February only a few had shown any signs of growth. These were led by the Woodsias, which had already made an appreciable showing. By this time it was evident that higher temperatures would be necessary. Consequently the night temperature was raised to 65° and was allowed to run on bright days up to as high as 90° or 95°. At these temperatures nearly all commenced growing actively except for the great majority of the genus *Dryopteris,* which still remained reluctant and unwilling to start actively. As a last resort the backward members of this group were placed beneath the bench where the heat from the pipes could reach them directly. Their resistance was broken, and growth commenced and proceeded as normal.

Attention Indoors

Once in the forcing house the care of the ferns was guided by our knowledge obtained from forcing other plants of a similar nature, so that a departure from the theory of treating them as naturally as possible was inevitable. The entire group was shaded regardless of the fact that many are quite tolerant of the sun. This again was justifiable in that root development was much slower than top development and too much exposure would quite likely cause burning of the foliage. This shading started around the first of February and was accomplished by spreading cheesecloth over them supported on wires. This was later supplemented as the sun grew strong by shading the roof of the house.

Watering and syringing also required special attention. Since we had no facilities for heating our tap water, several large barrels were filled and allowed to warm up to house temperature before using. The syringing of plants is in itself an art, and not a practice to be recommended to amateurs in the growing of ferns, for not only may it spread disease if incorrectly done but it is likely to cause the compact types to dampen off if applied too heavily.

Though it was our aim to have the ferns as fully developed as possible, there are many species that are equally attractive in their unfurling stage. The cinnamon fern (*Osmunda cinnamomea*) is especially desirable for this treatment as its crosier-like fronds are large, vigorous and readily forced. For showing in the middle of March, 10 days to 2 weeks in strong heat will bring them well up. Earlier showing will take correspondingly longer. It is a recognized fact that all hardy material forces more easily and quickly the nearer it approaches its natural growing season.

For winter display hardy ferns have proved themselves worthy subjects. Besides the fact that they require only a very short season for growth, their relative ease of culture and long keeping quality even under adverse conditions are additional reasons to warrant their use.

Spring Lectures At The Garden

The spring series of free Saturday afternoon lectures at the New York Botanical Garden, which began on April 6, will continue two weeks longer than usual this year, closing on June 15. The program is as follows:

Apr. 6 ***A Botanist Looks at a Garden***
H. W. Rickett, Assistant Bibliographer

Apr. 13 ***Food and Beverage Plants of the Indians***
G. L. Wittrock, Custodian of the Herbarium

Apr. 20 ***Planting the House-Front***
P. J. van Melle, Nurseryman

Apr. 27 ***How the U. S. Keeps Our Foods and Drugs Pure***
William J. Bonisteel, Fordham University

May 4 ***Photography in the Garden***
Fleda Griffith, Artist and Photographer

May 11 ***New York's Native Wild Flowers***
E. J. Alexander, Assistant Curator

May 18 ***Better Iris for Our Gardens***
Harriette R. Halloway, Amateur Horticulturist

May 25 ***Fiji and Its People***
A. C. Smith, Associate Curator

June 1 ***Sanctuaries and Nature Trails***
Mrs. Luis J. Francke, Garden Club of America

June 8 ***Plants of the Bible***
H. N. Moldenke, Associate Curator

June 15 ***The Art and Science of Growing Roses***
P. J. McKenna, Foreman Gardener, and B. O. Dodge, Plant Pathologist

Raising Ferns From Spores

By T. H. Everett

IN gardening practice the raising of plants from spores is practically restricted to ferns, and more particularly to those kinds which are not readily increased by division. Fresh spores give the best results. Fronds should be gathered when the sporangia are dry and are beginning to burst. They are placed in tight envelopes or folders of smooth white paper until the spores are released as a fine brown dust. Usually ferns breed true, but if spores from more than one kind are sown together hybrids may result.

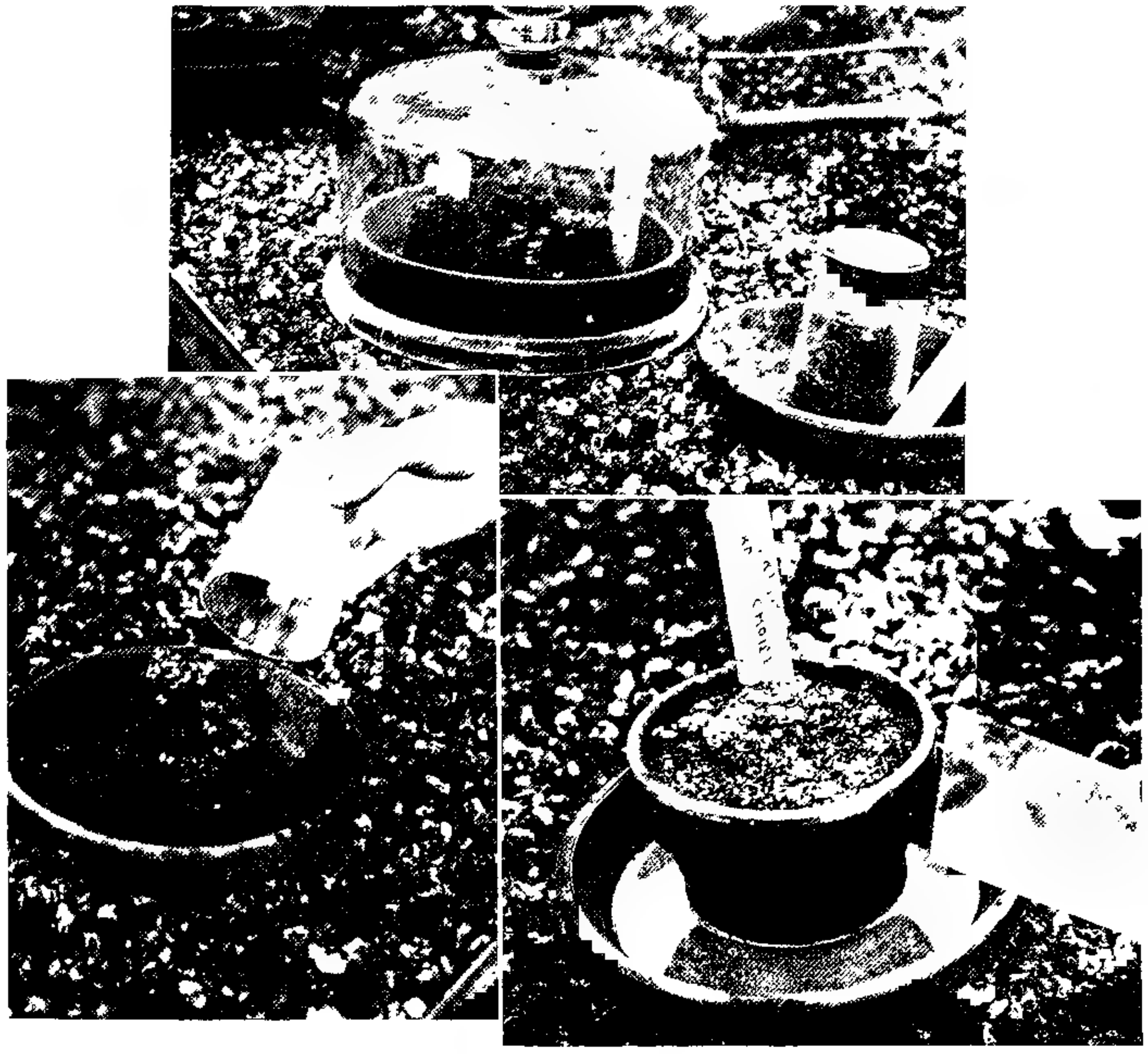
The environmental factors essential for growing plants from spores are the same as for growing plants from seeds with the added need in the case of spores for a constantly saturated atmosphere, in order that the prothalli will be at all times moist. Sterile conditions are also very important, for liverworts and other low forms of plant life revel in conditions favorable to the germination of spores and may crowd out or destroy the prothalli.

Sowing in Soil

Pots or pans are the most convenient receptacles in which to raise plants from spores. Like the soil and the glass used for covering they should be sterilized shortly before use by baking or steaming. The technique employed in filling the containers is the same as is used in preparation for sowing seeds in soil. The surface should be made very fine and absolutely level. Because of the minuteness of the spores, sowing should be attempted only in a place where the air is quite still. The spores are scattered evenly and rather thinly over the prepared surface, but are neither pressed in nor covered with soil. After sowing, the receptacles are covered with glass and paper and are put away in a humid propagating case. Each pan is stood in a saucer and this is filled with water (first boiled and cooled to approximately air temperature) at sufficiently frequent intervals to make sure that the surface soil never becomes dry. When the prothalli begin to form, the paper is removed and protection against strong light is given by applying a light shade over the sash of the propagating case or by covering it with a layer or two of cheesecloth. If the prothalli are crowded or if they begin to die off, transplanting must receive early attention.

Sowing on Pots or Brick

Fern spores may be germinated quite readily on the moist surface of a flower pot or rough brick. A pot 2½ or 3 inches in diameter is of convenient size and it should be filled tightly with sphagnum moss and stood



Ferns being raised from spores. Above: Sown on inverted flower-pots filled with sphagnum and kept beneath a belljar and a tumbler. Left: The first vegetative leaves arising. Right: Young ferns growing from spores sown in a pan of sterilized soil and covered with a pane of glass.

bottom side up in a saucer. If brick is used select a soft, porous sample rather than one which is hard or vitrified. Break each brick in two and stand each half in a saucer or, as an alternative, break the brick into pieces about the size of walnuts and fill a saucer with these. To prevent contamination, pots, bricks, saucers and sphagnum are sterilized before use by baking, steaming or boiling, as also are the bell-jars used for covering purposes. Now thoroughly wet the surface of the pot or brick with water (which has first been boiled) and pour sufficient of this into the saucer to cover its bottom. In a still atmosphere scatter the spores over the brick or over the outer surfaces of the flower pot and then place the saucer and its contents in a propagating case beneath a bench or in some other shaded part of the greenhouse and cover with a bell-jar. Subsequent treatment is the same as when a sowing has been on soil.

Fern Diseases And Pests

By B. O. Dodge

WHILE ferns are much less subject to disease than many flowering plants, several fungi are prone to attack them from the time they first emerge from their microscopic spores as minute prothallia until they reach maturity with their full-grown leaves, or fronds. A number of insects also infest ferns both in the greenhouse and outdoors. A brief description of the most prevalent fern diseases and pests is given below, with measures for their control.

Prothallium Troubles. Those who propagate ferns by means of spores may find the prothallia damping off: that is, becoming soft, dark-colored, rotted and collapsed. This condition may be due to one of several fungi, among them species of *Pythium, Rhizoctonia* and *Botrytis.* These fungi are borne in the soil for the most part, although the spores of *Pythium* may be carried in the water if the supply comes from lakes or ponds. Spores should not be sown in soil that has not been sterilized, especially if the disease has previously been present.

Another disease which attacks ferns in their early stages is that caused by the fungus *Completoria complens.* It may be recognized on the prothallia by the small yellowish spots, which later become yellowish-brown, dotted with small holes and jagged. The fungus is probably carried on fragments of the fronds that have been sown along with the spores. It is recommended to sift out these fragments before sowing the spores.

Leaf-spots. Certain other species of fungi[1] attack the fronds of ferns, causing either reddish-brown or ash-colored spots which later turn brown. If the spots along the margins are zonate and the tufts of brown spores occur in loose chains (which, incidentally, cause the spores to scatter easily when the plants are syringed), the offending fungus is *Alternaria.* Good aeration and freedom from syringing should be provided where this disease is apt to occur.

Taphrina leaf-spot is characterized by definite yellow regions on both sides of the leaflets of the Christmas fern. The spore sacs are borne in layers near the surface of the leaf. This disease is reported occasionally from Maine to North Carolina. To control it in the garden, spray with Bordeaux mixture, which will also serve to control tip blight and other fungous diseases.[1]

Black Molds. Species of *Fumago* and *Teichospora* are frequently present on the fronds where scale insects are numerous and shed "honeydew". Where the mold gathers in thick black mats it shuts off the air and light from the leaves and also renders them unsightly. Controlling the scale insects or others that shed honeydew usually prevents the development of these sooty molds.

Eelworms. Many species of greenhouse ferns are subject to attack by the little eelworms known as nematodes. The disease caused by this pest is easily recognized on certain ferns by the reddish-brown or blackish bands extending from the midribs to the borders, the spots being limited by the parallel side veins. In other kinds of ferns the spots are more or less irregular. In the bird's-nest fern (*Asplenium Nidus*), the base of the leaves becomes infected first, then the brown discoloration spreads out and extends upward until more than half of the leaf is involved. When all of the leaves in the cluster are attacked in this way the plant usually dies. Some of the leaves may escape, so that the plant may live for many months although heavily infested. By teasing out small fragments of the brown areas in water and examining them under the microscope, one readily sees the little worms moving about. To control, remove and burn infested leaves or entire plants if badly infested. Do not throw them on the compost heap, since the worms live a long time in such debris and infest other plants grown in soil that includes material from mulch piles. Bird's-nest ferns can sometimes be freed from nematodes by immersing them in hot

1 Among them are *Cylindrocladium pteridis, Phyllosticta pteridis* and *Alternaria polypodii.*

Evidence of eelworm infestation on a bird's-nest fern (left) and on a leaf of the Cretan brake.

water (43° C., 110° F.) for 10 or 15 minutes. In propagating, use only worm-free plants.

Thrips. In addition to the common greenhouse thrips (*Heliothrips haemorrhoidalis*), a second species, *Leucothrips nigripennis,* is known to infest ferns heavily. Badly infested specimens should be discarded since the control of thrips on such plants is rather impracticable. Spraying with contact insecticides, such as nicotine sulphate, is helpful, however, if repeated frequently and if one does not delay.

Scale Insects. There are three or four species of scale insects which infest ferns in greenhouses. The soft scale (*Lecanium hesperidum*) is one of the most destructive scales. It is reddish brown and low-convex to flat, and produces many young over long periods. The fern scale (*Hemichionaspis aspidistrae*) is often sufficiently numerous to render ferns unsightly and worthless. The males are white and conspicuous, while the females are ochre-brown in color. Mealy bugs which belong to the scale insect group are also serious pests of certain ferns if allowed to become numerous. Ants frequently carry young scale insects and mealy bugs around so that the control of the ants by the use of ant poisons may be necessary. Spraying the plants with the old well-known product, lemon oil, diluted with warm water and washed off after 3 or 4 hours is still one of the best remedies for fern scale. Some of the white oils, such as Volck 1:50, can be used without injury to most ferns. Maidenhair fern, however, is said to be very susceptible to spray injury.

Snails, cut-worms and other pests sometimes attack ferns along with other greenhouse plants, and should be kept under control by the methods used to protect other plants in the greenhouse.

New Name Proposed for the "Garganica" Group of Campanulas

By P. J. van Melle

AMONG campanulas seen in rock gardens, none are more widely planted than the range of garden hybrids known as *C. garganica.* These are also, though less commonly, known as *C. fenestrellata, C. istriaca* and *C. Barbeyi.*

All of these are good specific names, representing distinct species, and are most inappropriately applied to these hybrids.

The name most commonly used, *C. garganica,* was published in 1827 by Tenore for a plant of limited distribution in the spur of the Italian boot. Very soon he and subsequent authors came to include under this name several other circum-Adriatic kinds. In 1890, Henri Feer, a Swiss student of *Campanula,* in a technical study published in the *Journal of Botany,* which appears not to have been absorbed in horticultural cyclopedic literature, redefined *C. garganica* of Tenore, separating from it and describing the other three kinds named above. His type specimens are preserved in the Herbarium Boissier, Geneva, Switzerland, whence, through the courtesy of the New York Botanical Garden, I was enabled to obtain their use for study. It appears that Feer's species have been poorly understood, and are unreliably treated in literature; while accounts of *C. garganica,* prior to 1890, are of little use today, since they include mostly all of these Feer species.

In my study of this subject I have found no indication that *C. garganica* of Tenore has been at all in cultivation in this country, or, to any appreciable extent, in Great Britain. Early British garden accounts of it give evidence of confusion with another kind from the same limited locality, which is, indeed, very distinct, and which Feer separated as *C. Barbeyi.* Nor have I found recognizable indication of hybridity with *C. garganica* in the garden group here under discussion. A sheet in the Bailey Hortorium, from Edinburgh, #409, named

A group of Adria hybrids in the garden of the late Clarence Lown.

C. garganica var. ***D. H. Paine,*** is *C. Barbeyi.* I am prepared to say that none of the materials bearing varietal names under *C. garganica,* of which I have been able to find record, represent recognizable forms of this species. *C. garganica* var. *hirsuta* (or *villosa*), as grown in this country and in Great Britain, represents hybrid material—not *C. garganica* var. *hirsuta* of Tenore (which is an invalid name). The name *C. garganica* has no relation at all to the hybrid material cultivated under that name.

burgh, #268, in the Bailey Hortorium, labeled *C. istriaca,* appears true. While I have found, among American garden materials, forms approaching more or less to true *C. istriaca,* one may say that practically no true material of it is about, though its influence is recognizable in the hybrids.

Garden material grown in this country is of the same seed-origins as that grown in Europe, and practically all the seed offered under any of these specific names is of garden origin. The conclusion seems

Campanula ×Adria, Clarence Lown. The original clump in the same rock garden. Note the erratically varying number of corolla lobes, characteristic of this clone and reaching nine at times.

Of the three Feer species, I have found no recognizable material in cultivation of *C. fenestrellata.* I once gathered a large series of hybrids grown under this name in nurseries, and, upon examination and dissection, found them to be all hybrids with a predominating influence of *C. Barbeyi.* I have found no true *C. Barbeyi* among American garden materials, but found evidence of its being in cultivation to a very slight extent in Great Britain, though very rare. A sheet from Edin-

justified, therefore, that practically none of Feer's species are in cultivation to an appreciable extent.

My investigation of a great deal of garden material leads me to conclude that this so-called *"garganica"* group represents hybrids of *CC. Barbeyi, fenestrellata* and *istriaca,* in which the *Barbeyi* influence predominates. From it comes a tendency to hairlessness, a frame of sturdy, stout stems, crenate basal leaves, and a violet-blue (not the best) shade of

corolla lobes. *C. fenestrellata* contributes a hairless and shiny quality of leaf, stem and flower, hair-fine pedicels, and a pale, lilac-blue (very lovely) shade of corolla lobes. *C. istriaca* lends hairiness, clear-blue corolla lobes, and relatively very short sepals. To a very slight extent one finds, also, some influence of *C. Elatines.*

Inasmuch as *CC. garganica, Barbeyi, fenestrellata* and *istriaca* are of potential garden value, and likely, sooner or later, to become available in true form, it is unfortunate that their names should be so improperly applied to and interchanged for this hybrid group; and that confusion should continue to be piled up under these names in garden literature.

By way of escape from this impasse, I propose to growers and dealers and writers that, for the present, they abandon in relation to this so-called *"garganica"* group, the names *garganica, fenestrellata, Barbeyi* and *istriaca,* and place no reliance on horticultural accounts, to date, of these species; and that for this same group of garden hybrids, they adopt, instead, a new horticultural group name, *Campanula ×Adria.* Under this name may well be introduced any clonal form deemed worthy of distinction by name. Under it I would list the plant grown as *C. garganica hirsuta,* which would become *C. ×Adria hirsuta.* Here belongs also the clone I described at one time as ***Clarence Lown.***

If and as genuine materials of the four species above named may become available, it would be desirable that the introducer might, prior to introduction, have them checked competently against Feer's study and type specimens. We shall never come to know these species intelligibly until we first get their names out of the way in relation to the nondescript hybrids now widely known under these four names.

Two Volumes on Cariceae Appear This Month

KENNETH K. Mackenzie's monumental work on the sedges is being published this month by the New York Botanical Garden under the title of "North American Cariceae." Illustrated with 539 plates of *Carex* and related genera drawn by Harry C. Creutzburg, the monograph fills two volumes 10¾ by 13½ inches. It is indexed. The edition, which is limited to 500 copies, is being sold at cost price: $17.50 bound in library buckram, or $15.50 unbound.

Preparation of this work took many years of Mr. Mackenzie's life, and he personally supervised Mr. Creutzburg's drawings. Upon his death in 1934, at the age of 57, the New York Botanical Garden received all his herbarium specimens (a collection of some 40,000 sheets) and he also bequeathed all of the drawings of plants made for him by Mr. Creutzburg, and the sum of $10,000 for their publication with his manuscript, which was already in the Garden's hands.

Mr. Creutzburg's work displays a rare combination of both artistic and scientific perfection. In addition to the complete plant from root to flower-cluster, he has shown vegetative portions and flower parts in microscopic detail. The work occupied him for about 12 years.

Mr. Mackenzie, who was a corporation lawyer, was also the country's foremost authority on *Carex.* His studies were made in close co-operation with the Botanical Garden, and he was a member of the Board of Managers for nearly 12 years.

The Garden's announcement of the publication of this joint labor says in part:

"In this authoritative work, the New York Botanical Garden presents the first complete atlas of illustrations of the North American sedges. The genus *Carex,* with a few small closely related genera, contains no less than 539 species in North America. Every species of this area, which includes Mexico, Central America, the West Indies, and the arctic regions, is illustrated by a full-page plate, which exhibits the habit of the plant together with enlarged details of its chief diagnostic features. Each plate is faced by adequate descriptive text. The two volumes are obviously of fundamental importance to all students of the flora of the continent, and in addition form an indispensable reference book for persons concerned with conservation and protection of wild life."

Certain species of sedge rank among the important foods of wild birds, especially during migration, as well as forming valuable ground-cover in low areas. It is therefore of utmost importance that these be known and protected.

This is a typical plate made from one of Harry Creutzburg's drawings for K. K. Mackenzie's "North American Cariceae." It is Plate 15, showing Carex Douglasii.

W. P. A. Exhibit May 20-25 In Museum Building

HOW the Work Projects Administration benefits the people of New York and the scientific world through its work at the New York Botanical Garden will be shown in exhibits and demonstrations to be staged in the Museum Building May 20 25.

These dates have been set aside throughout the nation by the Professional and Service Division of the W.P.A., and the period will be known as "This Work Pays Your Community" week. Between 9 and 10 p.m. on the opening night, there will be a broadcast from Washington over a national hook-up. Preceding this program, W.P.A. workers from the Botanical Garden will meet for dinner and "home talent" entertainment.

During the week, guides will be provided from the W.P.A. forces to conduct visitors through the Main Conservatories and around the grounds and the Museum Building. In the rotunda of the museum there will be an exhibit of drawings, paintings, and photographs done by W.P.A. workers and on the second floor posters depicting activities of the W.P.A. at the Botanical Garden. On the mezzanine there will be a demonstration of mounting plants for the herbarium and of methods employed in combating the Japanese beetle — two important phases of the work of the W.P.A. at the Garden. Receptionists from the ranks of the project will greet visitors and explain the work being done.

Magazine Produced by Gardeners Appears at Forum Dinner

THE fifth annual dinner of the Gardeners Forum, which took place at the Beekman Tower Hotel April 13, was marked by the appearance of an initial number of *The Forum Annual,* a publication by and for the student gardeners, intended to become somewhat comparable to the Journal of the Kew Guild. It was edited by Ralph Pinkus.

Speakers at the dinner, at which Fred Sparks, superintendent of the Cutting estate, was toastmaster, included P. J. van Melle, James B. Jack, Elizabeth C. Hall, T. H. Everett, Robert Scott, George Gillies, and Clarence Lewis, besides six of the former student gardeners who are now working elsewhere: Edward Brennan, George McGregor, Martin Crehan, Nicholas Pecora, John Moss, and Philip Chandler. David Melrose also spoke briefly, as a representative of the student gardeners of today, and Joseph Smith, who has been a gardener at the Botanical Garden since 1895, told of the stone walls and weeds which, 45 years ago, occupied the site where he now works in the palm house in Range 1.

Robert Simpson was given a set of Britton & Brown's Illustrated Flora as a prize for having made the best herbarium collection during the past year. The presentation was made by Dr. William J. Robbins. More than 90 persons, including several from the scientific staff, attended the dinner.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

1,000 Shrubs Described For Botanist and Gardener

AN ILLUSTRATED MANUAL OF CALIFORNIA SHRUBS. Howard E. McMinn. 689 pages, illustrated with 40 photographs and numerous drawings; J. W. Stacey, Inc., San Francisco, 1939. $5.

The author of the popular "Illustrated Manual of Pacific Coast Trees" (now in its third edition) has brought forth another fine work on a subject of widespread interest, the native shrubs of California. This book is the result of 20 years of study and research carried on in the field and in botanical gardens and herbaria in this country and abroad. For the same period of years, Professor McMinn has also had the opportunity of observing more than 300 shrub species

growing in the native California shrub collection at Mills College, where he is Professor of Botany. As a member of the Advisory Council of the Santa Barbara Botanic Garden, which is devoted exclusively to native California plants, he has had a further opportunity to study these plants under conditions of cultivation.

Approximately 800 species and 200 varieties are included in this manual. The introduction contains notes for the layman on the classification and naming of plants, composition of the shrub areas of California, and a brief explanation of some of the more widely used botanical terms. The keys are prepared after years of practical classroom application and are easy to use. The descriptions of species are full and complete and include data on range and use. The work is profusely illustrated with pen drawings and photographs. The abundant drawings illustrating diagnostic characters are clear and detailed. This feature is of inestimable value to the student of taxonomy and particularly to the layman, to whom a glossary definition of a botanical term so often fails to convey the author's concept of the point in question. The photographic reproductions are the finest we have seen on this subject.

The closing chapter deals with the use of native California shrubs as ornamentals. This section was prepared by Fred H. Schumacher, Landscape Architect of the United States Forest Service, and includes lists of plants together with valuable information relative to their possible utilization in the landscape.

This book promises to serve a rather unique twofold purpose in that the library of the professional botanist will not be complete without a copy and in addition it should prove to be of equal importance to the horticulturist and gardener. Professor Herbert L. Mason of the University of California expresses this point very ably when he states, "Professor McMinn has been eminently successful in bridging the gap between the technical needs of the practising botanist and the interests and questions of the amateur plant student and gardener."

MAUNSELL VAN RENSSELAER,
Director, Santa Barbara Botanic Garden.

Life Among the Headhunters

OFF WITH THEIR HEADS. Victor Wolfgang von Hagen. 220 pages, illustrations, glossary. Macmillan, New York, 1937. $3.

Into his account of eight months spent among the Jivaro Indians of the upper Amazon region, Dr. von Hagen has woven much that will be of interest to the reader concerned with plants. The members of such an Indian society depend upon the surrounding vegetation for the greater part of their culture — their food, dwellings, dress, weapons, etc. Dr. von Hagen, with his ability of keen observation, has recorded the fascinating facts of their method of life. Doubtless the botanically inclined reader will wish for more detail and accuracy as regards the identity and culture of the plants which are the basis of Jivaro civilization, but in this book he will find far more information of this sort than in the average travel book. The account, which is well illustrated by photographs and a map, is always intriguing, if frequently a trifle gruesome. One sees that a good sense of humor, like Dr. von Hagen's, is essential to a traveler among the headhunters.

A. C. SMITH.

Key to the Mucorales

CLÉS DES MUCORINÉES. N. A. Naumov. 173 pages, 83 figures, Paul Lechevalier, editor, Paris, 1939. Volume 9 of Encyclopédie Mycologique, translated from the second Russian edition by S. Buchet and I. Mouraviev. Paper bound, 100 francs.

The volume is divided into four parts. Part I is a general discussion of the characteristics of the order Mucorales. Part II is a key to the genera. Part III, the key to the species, is the main part of the book. Part IV is an alphabetical list of the species, their synonyms and *nomina regicienda*. There is a bibliography and a list of the Mucorales in which sexual reproduction has been observed. About 400 species of Mucorales are given in the key; of these 108 are known to form zygotes, 59 are known to be heterothallic, and 33 promothallic.

The classification according to the monograph of Zygha which was published the year this book was written (1934) is given in an appendix.

FREDERICK W. KAVANAGH.

Explorers of the Past Lead the Way

THE GREAT NATURALISTS EXPLORE SOUTH AMERICA. Paul Russell Cutright. 340 pages, illustrations, bibliography, index. Macmillan, New York, 1940. $3.50.

This is a book which every reader, regardless of the direction of his interests, will enjoy if he is curious about that least known of continents, South America. The first and shorter of the two parts discusses, with succinct accuracy, the travels and contributions of the better known scientific travelers to South America. These include Humboldt and Bonpland, Darwin, the Schomburgks, Wallace, Bates, Spruce, Hudson, and others of nearly equal fame. As an introduction to the work of these travelers, the reviewer knows no better concise treatment.

But this introduction is not the last we hear, in Dr. Cutright's book, of the great explorers. The remaining pages are devoted to discussions of the animals of South America. Each chapter takes up not only the classification, geographical distribution, general description, and habits of a single animal or a group, but also the more important observations made on the subject by previous field workers. Thus one reads again of Schomburgk's observations on the dancing of the cock-of-the-rock, of Beebe's experiences with vampire bats. The chapter on jungle pests should certainly be read by everyone who contemplates field work in South America; it is so vividly written as to approach the real thing.

Botanically inclined readers will regret that the author has passed over this phase to emphasize his own vocation, zoology. But nevertheless the book is thoroughly readable and important; even a botanist should know the difference between a hoatzin and a fer-de-lance.

A. C. SMITH.

Notes on Recent Publications

Books on Nature

A BIBLIOGRAPHY OF NATURE-STUDY. Eva L. Gordon. Reprinted from Anna Botsford Comstock's Handbook of Nature-Study, 24th edition. Pages 864-908. Comstock Publishing Co., Ithaca, N. Y., 1939. $.25.

A useful list of books for both children and adults, classified as to subject, with a comment on each one and a notation giving the approximate age for which the volume is most suitable.

Out of the 17th Century

DELIGHTES FOR LADIES. Sir Hugh Plat. 1627. Collated and edited by Violet and Hal W. Trovillion. 120 pages, illustrated with decorations from the edition of 1609; index and glossary. Trovillion Private Press, Herrin, Ill., 1939. $2.50.

Recipes for cakes, preserves, meats, fish, drinks, and toiletries, in the words of an Elizabethan writer.

Whence?

OUR GARDEN. Charles Fitch Barber. 136 pages, photographs. Binsford & Mort, Portland, Ore., 1939. $1.50.

A famous delphinium breeder credits the spirit world for the creation of some of his finest hybrids.

Current Literature At a Glance*

By Virgene Kavanagh

Fuchsias. "The Fuchsia Annual 1939" is a distinctive publication of a flower society. It contains four colored plates of five outstanding fuchsias, seven other plates, and nine articles on fuchsia culture and kinds. This is the second year of issue. It is obtainable for five shillings, from W. W. Whiteman, Secretary, Abbots Lodge, Sandhurst, Gloucester, England.

Wild Flowers. The March Bulletin of the School Nature League is on "Early Spring Wild Flowers" and has figures

* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

and photographs as well as descriptions of the flowers common to the New York area from March to May. The author is Dr. John W. Thomson, Jr.

Liverworts. Perhaps the least well known of the green plants are the liverworts; therefore "Liverworts of Southern Michigan," which is written as a guide for beginners, should be of interest to many people who like to know about the common plants. It has keys, descriptions, illustrations, and a glossary and also directions for collecting and keeping liverworts, bits of history and many other things worth knowing. This 97-page bulletin is by William C. Steere and is published by the Cranbrook Institute of Science, Bloomfield Hills, Michigan, for 50 cents.

South Africa. A beautiful new mint of the genus *Pycnostachys* and another labiate, *Iboza riparia*, which is grown under glass at the New York Botanical Garden, are shown in the January number of *The Flowering Plants of South Africa.* This Journal is one of the few which still supply hand-colored plates of each species described. This same number has plates of four species of *Aloe*, a *Nemesia*, a *Gladiolus*, and several other plants.

Fungi. Dr. G. W. Martin has reissued his "Outline of the Fungi" with revisions. Consisting of a key, a brief glossary, and a brief bibliography, it has apparently proved very popular, since the 1936 printing is exhausted. It appears as University of Iowa Studies, Volume 18, No. 1, 1940. Price 20 cents.

Safety. Christmas trees may be practically fireproofed by immersing the cut trunks in strong solutions of ammonium sulfate or calcium chloride. Complete directions are given in U. S. D. A. Leaflet 193. Formulas and directions for fireproofing other substances are given in U. S. D. A. Farmers' Bulletin No. 1786.

Tree Story. "Southern Pines Pay" is a picture story of some reforested areas in southern states, told in U. S. D. A. Miscellaneous Publications No. 357. Some of the pictures are on private farms, some on railroad lands and some in national forests. The amount of growth the pines made in ten to eighteen years is almost unbelievable.

Easy Identification. "Keys to the Woody Plants of Iowa in Vegetative Condition" by Harold D. Harrington consists of a distribution list of native woody plants, a key to the genera of woody plants growing in Iowa, a key to the genera of woody plants native to Iowa, and a key to the species. The keys seem relatively simple and should be helpful to anyone wishing to learn to recognize plants when they are not in flower. University of Iowa Studies, Vol. 17, No. 9, Iowa City, Iowa. 50 cents.

Zinnias. Growers of zinnias will be interested in the field trials of 194 samples of seeds from four of the large seed companies made by Pennsylvania State College and published as Bulletin 386. Of all the varieties tested, only the small single orange colored *Zinnia linearis* produced flowers all of which were of the type expected. Most constant of the doubles was the scabious type with about 60 per cent of the kind expected. All of the large-flowered doubles were variable; the varieties of the California giant type were somewhat more constant than the dahlia type or the double giant type but only 10—60 per cent were of the expected type. None of the small double types were constant and no true whites were obtained. The details of the experiment are given in a 12-page table.

Soybeans. So many uses have been developed for the serviceable soybean in America today that the revision of U. S. D. A. Farmers' Bulletin No. 1520, "Soybeans: Culture and Varieties," is certain to be in demand. This bulletin gives something of their history and distribution as well as the varieties grown in the United States and methods of culture.

School Gardens. A complete program for the teaching of gardening in schools is outlined in a paper-covered, illustrated volume of 134 pages recently issued by the School Garden Association of New York. Sub-titled "A Laboratory of Nature," "The School Garden" was prepared by Van Evrie Kilpatrick, Executive Vice-President of the association. The history of the movement is given, the purposes are explained, and suggestions are offered for year-around projects and lessons in indoor and outdoor gardening and nature study.

Notes, News, and Comment

Tulips. About 35,000 of the gift of more than 47,000 bulbs from the Holland Bulb Industry of Haarlem, Holland, will be in flower during May at the New York Botanical Garden. On both sides of the path which leads from the station of the Third Avenue Elevated to the Main Conservatories, the earlier-flowering tulips have been planted, while a dozen varieties of Darwins occupy the conservatory court.

National Academy. Dr. William J. Robbins was elected a member of the National Academy of Sciences at its annual meeting in April in Washington, D. C. Among those who attended the sessions were Dr. B. O. Dodge, Dr. Edmund W. Sinnott, and Dr. R. A. Harper. Dr. Sinnott presented a paper with Robert Bloch of Columbia entitled "The Division of Plant Cells Induced by Wounding."

Tea. The annual spring tea of the Board of Managers and the Advisory Council of the New York Botanical Garden will take place the afternoon of Friday, May 24. It will be accompanied by an inspection tour of the perennial border of the Advisory Council and of the Thompson Memorial Rock Garden. On the same day the Garden will be host to the Woman's National Farm and Garden Association, which is having its annual meeting in New York at that time. The group will join with members of the New York Botanical Garden for tea.

Rock Garden Week. With Friday and Saturday, May 24 and 25, designated as members' days, Rock Garden Week will officially open for the public at the Botanical Garden on Sunday, May 26, and continue through June 1.

Art Exhibit. Paintings of vegetables, flowers, gardens and landscapes in Connecticut will be shown in the Museum Building at the Botanical Garden May 11-30 by Louis Weinberg, Professor of Art and Sub-chairman of the Art Department in the School of Business and Civic Administration at City College, New York. The collection includes several scenes on the estate of Carlyle Bennett at Westport, Conn., the grounds and green gardens of which were designed by Frederick Law Olmstead. The show will be further distinguished by what the artist calls a "glorification of the cabbage." Corn and other garden vegetables also will be shown in oils.

Lectures. Dr. William J. Robbins addressed the Journal Club at Bryn Mawr College April 10 on "Vitamins as Growth Substances for Plants." On April 9, Dr. A. B. Stout spoke before the biology students of Brooklyn College on "Incompatibilities in Flowering Plants." The evening before he lectured on "Lilies for Gardens" at a meeting of the Long Island Horticultural Society at Farmingdale. T. H. Everett spoke before the Flushing Garden Club on "Practical Gardening" March 25. Mrs. Hildegard Schneider talked on the New York Botanical Garden before the Greenwich Village Historical Society April 9. On April 15 P. J. McKenna spoke on "Flowers for Exhibition" at the Mt. Vernon Garden Club and on "Lawns" before the Men's Garden Club in New York on April 4. Dr. H. W. Rickett addressed the Barnard Botanical Club March 29 on "The Flora of Missouri." "Our Native Ferns" was the subject of Dr. A. C. Smith April 17 before the Morristown Ladies' Club. Dr. H. N. Moldenke spoke on "Treasures of the Watchungs" on Easter Sunday as part of the Sunday science series at the Newark Museum. Types of fungous diseases of plants formed the topic of Dr. B. O. Dodge April 2 for students in medical mycology at the College of Physicians and Surgeons.

Student Gardeners. Edward Brennan and George Lupton have gone into business for themselves as landscape gardeners with headquarters at Roslyn, Long Island. They were graduated from the Science Course for Professional Gardeners in 1937 and 1936, respectively. Later both of them worked on the estate of Mrs. Roswell Eldridge at Great Neck, under James G. Esson. George McGregor, who was graduated from the Science Course a year ago, became greenhouse assistant to Mr. Esson on April 1.

Conference. Dr. F. J. Seaver spoke at the monthly conference of the scientific staff and registered students of the Garden April 12 on "Contributions to the Mycoflora of Bermuda." He was followed by Ellys T. Butler with a paper on "Ascus Dehiscence in *Lecanidion atratum*."

Director. Dr. H. N. Moldenke has been re-elected for a three-year term to the board of directors of the John Burroughs Memorial Association.

Groups. Members of the Torrey Botanical Club visited the laboratory of Dr. William J. Robbins the morning of April 13.

After hearing a brief discussion on the relation of vitamins to plant growth they viewed demonstrations of the laboratory's equipment. A class from the New Jersey College for Women under Dr. John A. Small joined the Torrey club in visiting the library at the Garden after lunch.

On March 29, 13 sub-debs from the Garden Club of Larchmont visited the propagating house and the conservatories. On March 26, 20 students from the School for Professional Art sketched in the Main Conservatories. The same day a group of Camp Fire Girls visited the conservatories and the museum, where they inspected chiefly the fossil plants and the section of *Sequoia gigantea.*

On March 27 a score of students from the Columbia Library School visited the Botanical Garden. T. H. Everett spoke briefly to them in the library on the responsibility of librarians and reviewers to keep trashy literature out of the field of gardening.

Dr. B. O. Dodge gave a demonstration of work in hybridizing fungi, followed by a half-hour talk, before a dozen members of the Torrey Botanical Club March 16. Thomas Laskaris exhibited cultures of delphinium rot and other cultures showing sexuality in the fungi. Dr. H. A. Gleason conducted the group through the Main Conservatories.

The Larchmont Garden Club visited all of the greenhouses at the Botanical Garden March 21.

Visitors. During the past two months, among the visitors who have registered in the library are George L. Slate, Geneva, N. Y.; John A. Small, New Brunswick, N. J.; Eleanor A. Friend, Glens Falls, N. Y.; F. R. Fosberg, Washington, D. C.; Elizabeth Mackay, Lafayette, Ind.; Frank E. Egler, Syracuse, N. Y.; R. T. Clausen, Ithaca, N. Y.; Joseph H. Pyron, Durham, N. C.; Claud L. Horn, Mayaguez, Puerto Rico; Ernest H. Casseres, Cartago, Costa Rica; Miriam Bomhard, Washington, D. C.; Leon Croizat, Jamaica Plain, Mass.; M. A. Chrysler, New Brunswick, N. J.; Harold St. John, New Haven, Conn.; and L. R. Holdridge, Rio Piedras, P. R.

Hostesses. The Advisory Council of the New York Botanical Garden will provide two hostesses a day at Gardens on Parade at the World's Fair between May 16 and 31. They will register guests at the Thatched Cottage.

Congress. At the eighth American Science Congress, to take place in Washington, D. C., May 10-18, five staff members will attend as representatives of the Garden and four of them will give papers. Dr. William J. Robbins will speak on "Vitamins as Growth Substances for Plants;" Dr. A. C. Smith on "Vegetational Zones of the Northern Andes;" and Dr. W. H. Camp on "Continental Displacement and the Origin of the American Floras." Dr. B. O. Dodge's paper will be entitled "Genetic Interpretations of Cultural Work in the Fungi." The Garden's fifth delegate will be Dr. H. A. Gleason.

Hardy Ferns And Their Culture

A 40-page booklet on HARDY FERNS, abundantly illustrated, is being published this month by the New York Botanical Garden. It will contain descriptions, cultural notes, and pictures from the Journal of March 1940 (which is now out of print), and also from April and the current number. "The Life Story of the Fern" will be included.

Twenty-five cents mailed to the New York Botanical Garden, Bronx Park, Fordham Branch P.O., New York City, will bring you a copy of this new booklet immediately.

PROGRAM

At The New York Botanical Garden

May 9, 1940

The New York Bird And Tree Club Co-operating

10 A.M.

MUSEUM BUILDING

Methods and Aims in Protecting Wild Flowers 30 min. — DR. P. L. RICKER
United States Department of Agriculture;
President, The Wild Flower Preservation Society, Inc.

Preservation of Wild Flowers by Education 30 min. — DR. E. L. PALMER
Professor of Rural Education, Cornell University;
Editor, Cornell Rural School Leaflets.

How to Raise Wild Flowers from Seed 30 min. — MR. ROBERT S. LEMMON
Editor, Real Gardening Magazine.

Protection of Wild Flowers by Legislation 15 min. — MRS. ALFRED ROELKER
Representing the Conservation Committee,
The Garden Club of America.

2 P.M.

MUSEUM BUILDING

Wild Flowers—Today and Tomorrow 30 min. — MR. HERMAN FORSTER
Assistant Commissioner, Department of
Water Supply, New York City.

Elizabeth G. Britton and the Movement for the Preservation of Native American Wild Flowers 15 min. — DR. C. STUART GAGER
Director, Brooklyn Botanic Garden.

Elizabeth Gertrude Knight Britton as a Scientist 15 min.
DR. JOHN HENDLEY BARNHART
Bibliographer, The New York Botanical Garden.

Presentation of the Elizabeth Gertrude Knight Britton Fund
DR. CLYDE FISHER
Curator-in-Charge, Hayden Planetarium;
President of the New York Bird and Tree Club.

Acceptance of the Fund for the New York Botanical Garden
MR. HENRY DE FOREST BALDWIN,
Vice-president, The New York Botanical Garden.

3:30 P.M.

IN THE WILD FLOWER GARDEN

Dedication of Bronze Plaque to Mrs. Britton
Unveiling by MISS DOROTHY OAK

Tea
Served by the New York Bird and Tree Club

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures, covering the algae, fungi, mosses, ferns, and flowering plants. 1918. $3.50.

A Text-Book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

North American Cariceae, by Kenneth K Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Periodicals

Addisonia, annually, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Now in its twenty-first volume. Subscription price, $10 a volume (four years). Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1 a year; single copies 10 cents. Free to members of the Garden. Now in its 41st volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $7 a year; single copies $1.25 each. Now in its thirty-second volume. Twenty-four Year Index volume $3.

Brittonia. A series of botanical papers. Subscription price, $5 a volume. Now in its third volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes, each to consist of four or more parts; 89 parts now issued. Not offered in exchange. Prices of the separate parts on request.

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CAROL H. WOODWARD, Editor
June, 1940

HYBRID TEA ROSE "STAR OF PERSIA" Cover Photograph by Fleda Griffith

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PRACTICAL GARDENING

At the New York Botanical Garden a new type of instruction in practical gardening has been inaugurated in which craftsmanship is being taught first-hand instead of by observation or by means of words from a book.

While the idea of having students in a course requiring skill perform every task for themselves is no innovation, this is believed to be the first time in this country that beginning gardeners have been taught how to use tools and handle plants under the direction of a group of eminent professional gardeners. Not only is each task explained and demonstrated to the class, but it is performed by each individual under the supervision of the instructor, who approves the technique before the student is permitted to proceed.

Following two terms of lectures this year by members of the gardening staff, sixty men and women are now meeting one night a week and spending two hours outdoors with spade, rake, and other implements, working strenuously at such fundamental gardening tasks as double-digging, fertilizing, raking, planting, sowing seed, propagating, staking, disbudding, pinching back, pruning, and other jobs which, without experience, are apt to tax the amateur gardener's skill.

The Botanical Garden's Two-year Course in Practical Gardening, organized in response to a trend toward a desire for greater practical knowledge, is apparently meeting a definite need among home gardeners for a type of instruction that combines thorough lectures in the essentials with the opportunity to work under critical supervision.

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VOL. 41 JUNE 1940 NO. 486

Mrs. Britton Honored in Dedication of Plaque By New York Bird and Tree Club In Wild Flower Garden

Ceremony and Presentation of Fund for Wild Flower Preservation Work Follow Program of Addresses

THE memory of Elizabeth Gertrude Knight Britton was honored on May 9 at the New York Botanical Garden in an all-day program devoted to the subject of wild flower preservation. In the afternoon the New York Bird and Tree Club dedicated a plaque to Mrs. Britton in the new Wild Flower Garden, following presentation of a fund of $1,800 to be known as the "Elizabeth Gertrude Britton Fund." *

The wife of Dr. N. L. Britton, who was the first Director-in-Chief of the New York Botanical Garden, was a pioneer—one might almost say *the* pioneer—in the movement for the protection of America's native plant life.

Now, through its new Wild Flower Garden, the maintenance of which will be aided by the income from the fund which bears her name, the New York Botanical Garden hopes to arouse new interest in the plants of the region and to create in the people a desire to respect and protect them. Informational labels in the garden, it is believed, will further this purpose.

The Wild Flower Garden, located in the woods in the southeastern part of the enclosure for the Thompson Memorial Rock Garden, was started several years ago by the Botanical Garden, but as it was being developed gradually its existence was not made known to the public until last month. The date of May 9 for the dedication had been chosen as a likely one for the blooming of many native wild flowers in the area, but the late cool season held back all but a few Dutchman's breeches, Jack-in-the-pulpits, bloodroots, trilliums, and anemones.

* "The income from this fund shall be used for the installation and maintenance of a Wild Flower Area under the supervision and administration of the New York Botanical Garden, and for the development of interest in wild flowers and their preservation in such other ways as may seem advisable."—From a motion of the New York Bird and Tree Club.

The Bronze Plaque

"Let those who find pleasure in this garden remember Elizabeth Gertrude Knight Britton, lover of wild flowers and ardent advocate of their protection" is the wording of the bronze plaque, which was the gift of Mrs. David E. Oak, sister of Mrs. Britton, and her daughter, Miss Dorothy Oak, who unveiled the plaque. The design in the two lower corners represents the American holly, a plant for whose protection Mrs. Britton worked with special ardor.

The plaque is fastened to a ten-ton rock which was moved from the hill above the Thompson Memorial Rock Garden to a point near the juncture of the main paths in the Wild Flower Garden. Ten feet long and six feet wide, this bulky specimen of Bronx schist was given a three-day trip on wooden rails, assisted by a crew of five men with a tractor, along the "Snake Road" through the woods (so called because of the way it winds) and into its new position, where it fits as though it has stood there for centuries.

Practical Note in Program

In the addresses special stress was laid on the importance of using common sense instead of sentiment in working for the protection of the native wild flowers of America. The tendency, as Dr. E. L. Palmer pointed out, is to continue to recite poems about the spreading chestnut tree long after the chestnut has practically passed out of existence.

Dr. Ricker introduced this practical mood when he said:

"Entirely too much stress has been and still is being placed by most wild flower conservationists on the purely sentimental and esthetic values of wild flowers, rather than giving serious consideration to any practical means of preventing their extermination."

How the Greatest Destruction Occurs

"So strongly have these ideas taken root," Dr. Ricker continued, "that it has been almost impossible to induce most interested groups to do any wild flower preservation work other than educating school children and the general public against picking flowers and digging up the plants or passing laws for that purpose. They mostly overlook entirely the fact that in nearly every state hundreds, if not thousands, of acres of land, with attractive wild flowers, are being burned, grazed, or cleared every year for agricultural, manufacturing, residential, recreational, and highway purposes, destroying many times the number of flowers that are picked by wild flower lovers, roadside and market dealers, gardeners, nurserymen and drug collectors. Laws can not prevent the destruction of native plants by these causes. Laws can not prevent an owner or lessee of land from digging, picking or otherwise destroying native plants or from delegating that right

The plaque which was dedicated at the New York Botanical Garden by the New York Bird and Tree Club May 9, honoring Mrs. N. L. Britton for her pioneer work in the wild flower preservation movement.

to another, any more than laws can prevent picking and digging of cultivated flowers or vegetables. All such laws have to make these exemptions to be constitutional."

Recommendations from P. L. Ricker

"Surveys should be started in every county, of areas available and suitable for wild flower or general wild life preserves, before most of the worthwhile areas are cleared for agricultural, commercial, recreational, and residential purposes. Donations of land or funds for the purchase of one or more of the best areas should be obtained. In many cases this can probably be done only through the co-operation of several local, interested organizations.

"If neither the donation of land nor money for purchase can be obtained in sufficient quantity, application should be made to the nearest publicly

owned park or forest for the setting aside of at least 25 or 50 acres for a preserve. 'Civilization' of the area, or attempts to improve on nature, should not be permitted as has been done in some places. Plants of horticultural interest should not be introduced or plants not native of the region unless placed in a special, restricted area. Efforts should, however, be made to transplant to the area other rare or attractive plants of the region that are likely to be destroyed by the clearing of land."

In conclusion Dr. Ricker emphasized that while the wild flower educational work carried on in schools has value in creating a love of nature and interest in conservation in the rising generation, it is imperative that all interested groups devote the major part of their wild flower conservation activities at once to the more practical lines of work, as suggested above. If they do not, few of the younger generation who are being taught a love of nature will be able to find areas in which to see and study native plant and animal life.

Where Educators Have Failed

Dr. E. Laurence Palmer of Cornell University, Editor of the Cornell Rural School Leaflets, spoke of the problems in education that confront the leaders in the movement for the preservation of wild flowers.

He particularly emphasized some of the opportunities which he felt had been overlooked by wild flower preservationists.

The ten-ton rock on its three-day trip to the Wild Flower Garden, where it became the base for the plaque to Mrs. Britton.

"Off-hand in speaking of education one is inclined to think immediately of school programs," he said, "We have plenty of programs in schools or sponsored by school people which deal with wild flower preservation. We might well do without some of them. The Arbor Day technique started in Nebraska has found widespread adoption but it has had its weaknesses largely due to the lack of training of those guiding the immediate activities of the children. We have accepted as a substitute for inteligent treatment of plants the recitation of poems about plants. We have let elocution supplant agriculture and have spoken of the blacksmith under the chestnut tree long after both have become practically extinct."

Dr. Palmer spoke at length of the inadequacy, even the inaccuracy, of much of the instruction given in high school and college courses in the natural sciences, as regards botany both as a science and as a background for the understanding, appreciation, and preservation of the native flora.

"Programs dealing with plant management should not deal so strongly with problems of morphology and with homologies as they often do. What we want to know in wild flower preservation is how we can enjoy wild flowers, continue to enjoy them, and pass their value on, increased or undiminished, to those who will live where we now live. The 'Thou shalt not' philosophy of legislation is dangerous. Rather we should develop an understanding of what can be done with plants."

Dr. Palmer suggested some general rules which, if followed, would normally lead to a wise handling of the plants.

A Lesson from Dr. Palmer

"I have asked my students," he explained, "to study plants to determine what parts might presumably be picked without injuring the shape or the general health of the plant. We seek for what I call the 'danger point' below which the part cannot be removed. This prevents us from breaking the leading twigs of trees and shrubs. It makes it possible for us to pick the flowers but not the leaves of adder's-tongues, Dutchman's-breeches, trilliums, hepaticas. It saves spring beauty from exploitation and puts the yellow lady-slipper and some of its relatives where it can well survive.

"Another practice which I have recommended is that of asking people never to pick any flower unless there are five similar healthy plants within a radius of five feet. If this practice were followed universally, complete extinction of plants of the rarer sorts would be impossible and yet some collections could be made."

The Naturalist's Important Role

The "old-fashioned naturalist" was lauded by Dr. Palmer, in opposition to the college instructor who knows his plants only on the herbarium sheet. Botanists are far behind zoologists, he feels, in making their subject interesting to their followers.

"Plant students generally," he pointed out, "have overlooked the value of presenting the biographies of early workers in their field to the extent this has been done by the zoologists. Ask almost anyone what Audubon's specialty was and they know of him as a bird man. Ask anyone, particularly outside of Philadelphia, who the Bartrams were or about the Michaux family or about Rafinesque or Gray and you get no response. In spite of this these men had as interesting careers as did Audubon or Wilson or the better known ornithologists. About the only early botanist glorified in our schools is Johnny Appleseed, whose professional standing as a botanist certainly does not compare with many less praised men. Even when we have attempted to teach of the history of botany or of botanists we have confined our efforts to the technical morphologists, cytologists, physiologists and geneticists, leaving out of consideration the worthwhile work done by the old-fashioned naturalist. . Our school programs make little provision for the training of naturalists. I know a number of college teachers of biology who do not take their students on field trips because they admit that while they know materials in their field of specialty, they do not wish to be embarrassed by being unable to name some weed in their front lawn."

Dr. Palmer further pointed out the need for making wild flowers popular in such a way that the public would wish to enjoy them where they grow; and he stressed again the need for the dissemination of correct information about plants.

Wild Flowers From Seed

Useful instructions for the raising of wild flowers from seed were given by Robert S. Lemmon of New Canaan, Conn., Editor of *Real Gardening* magazine and a gardener of long and successful experience with native plants. Much of the information which he gave is contained in "Plants and Planting Methods for the Native Garden," which he wrote for this Journal in August 1939, as well as in a series of articles in his own magazine.

Laws and How They Work

The last address of the morning session was given by Mrs. Alfred Roelker of Bedford and New York, representing the Conservation Committee of the Garden Club of America in a survey of the types of laws in the various states and their effectiveness in the protection of the rarer native plants.

The Garden Club of America, she said, recommended that a wild flower sanctuary, to be properly protected, should have a fence with a locked gate, or a resident warden.

Mrs. Roelker announced that a file of state laws regarding wild flower

preservation had been assembled for presentation to the New York Botanical Garden. This will be kept in the library for public reference.

A Flower Lover Speaks

The afternoon program was opened by Herman Forster, Assistant to the Commissioner in the Department of Water Supply in New York City, who spoke as a lover of wild flowers, as an individual who wants them enjoyed and respected and saved for the benefit of his children and others of their generation who, learning to know them now, will gain an increasing appreciation for them as they grow older. "Wild Flowers—Today and Tomorrow" was the subject of his talk, which was filled with his own experiences in learning to recognize and understand the wild flowers he found around New York.

The addresses given by Dr. C. Stuart Gager, who at one time was on the staff of the New York Botanical Garden, and by Dr. John Hendley Barnhart are printed elsewhere in this issue.

Fund From New York Bird and Tree Club

Dr. Clyde Fisher, Curator-in-Charge of the Hayden Planetarium and President of the New York Bird and Tree Club, presented the Elizabeth Gertrude Knight Britton Fund to the New York Botanical Garden with a brief address to which Mr. Henry de Forest Baldwin, Vice-President of the New York Botanical Garden, responded in accepting the fund.

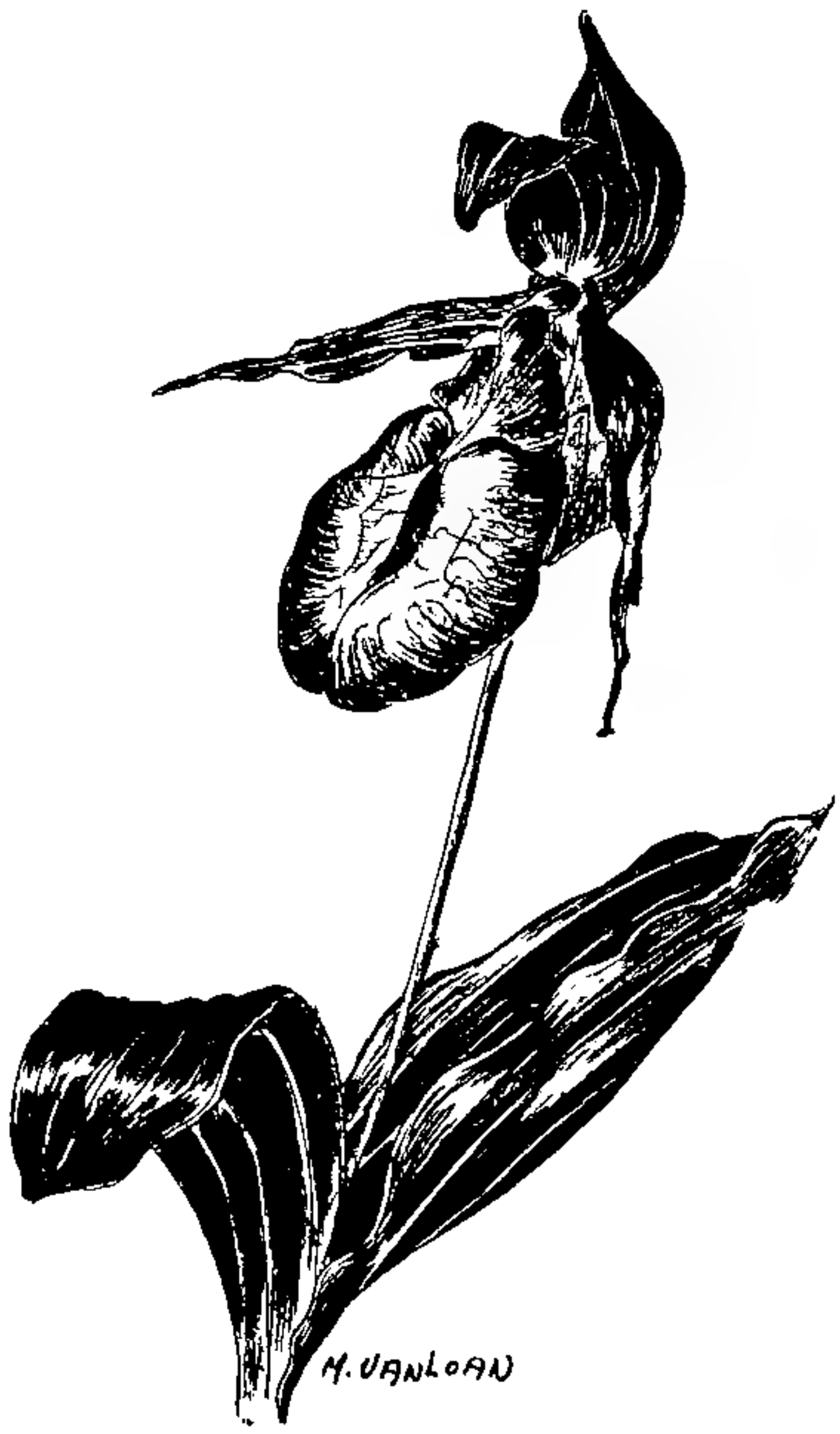
At 3:30 the audience, which numbered about 150 persons during the day, adjourned to the Wild Flower Garden for the unveiling of the plaque to Mrs. Britton. Tea was served immediately afterward by the New York Bird and Tree Club, with the following persons on the Reception Committee:

Mr. & Mrs. William F. Atkinson
Dr. & Mrs. Arthur E. Bestor
Mr. & Mrs. Edward K. Cherrill
Mr. & Mrs. Newcomb Cleveland
Mr. & Mrs. Warren Cunningham
Mr. & Mrs. Frank H. Downes
Dr. & Mrs. Clyde Fisher
Dr. & Mrs. C. Stuart Gager
Mr. & Mrs. Walter J. Greacen
Mr. & Mrs. John H. Hammond
Capt. & Mrs. Henry B. Heylman
Mrs. Elon Huntington Hooker
Miss Henrietta O. Jones
Mr. Van Evrie Kilpatrick
Mr. & Mrs. Walter G. King
Mrs. Waldine Z. Kopperl
Mr. & Mrs. Edwin D. Kyle, Jr.
Mrs. Bella C. Landauer
Mr. Robert S. Lemmon
Mrs. Mansfield Merriman
Dr. & Mrs. Forman T. McLean
Mr. & Mrs. William W. Nichols
Mrs. David E. Oak
Miss Dorothy Oak
Miss Bertha Pagenstecher
Mrs. John W. Paris
Dr. & Mrs. T. Gilbert Pearson
Mrs. George B. Pegram
Mrs. George W. Perkins
Mrs. Benjamin Prince
Admiral & Mrs. J. C. Pryor
Mrs. Abbey A. Rockefeller, Jr.
Mrs. Fred Joel Swift
Mrs. Thomas J. Watson

Both on the program and in the audience there were persons who had known and worked with Mrs. Britton for many years—some as much as 40 years ago. Drs. P. L. Ricker, C. Stuart Gager, Clyde Fisher, and J. H.

Barnhart all gave their recollections of Mrs. Britton and her absorbing interest in the wild flower movement. At times, according to Dr. Ricker, she was "almost the only constantly active worker for the cause." Yet she always labored with unbounded energy among individuals, schools, clubs, magazines, newspapers, motion picture houses, and lawmakers, to the end that today there are groups of people the country over striving to carry out a program which will ensure to future generations the abundant beauty of the wild flowers of an earlier and less urban period in America. Her work was the direct inspiration for the formation of at least twenty chapters of the Wild Flower Preservation Society. The conservation committees of the garden clubs of today are an indirect outgrowth of her relentless campaigning. One of the most active of these, the Conservation Committee of the Garden Club of America, was represented on the program.

Among those in the audience whose memories went back to the days of Mrs. Britton's earliest activity were Mrs. Addison Brown, widow of Dr. Britton's friend and co-worker; Mrs. Theron G. Strong, who has been associated with activities at the New York Botanical Garden since the beginning of the century; Mrs. Small, widow of Dr. John K. Small, who for 40 years was a Curator at the Garden; Dr. Alfred Meyer, one of the oldest members of the Garden both in point of age and membership, his name having first appeared on the rolls in 1900; the Misses Julia T. and Helena Titus Emerson, nieces of Ralph Waldo Emerson; Miss Mary E. Eaton, formerly artist on the Garden's staff, who has devoted much of her life to the painting of flowers in watercolor for publication; Mrs. David E. Oak, Mrs. Britton's sister, Mrs. George Wheeler of Yonkers and Mrs.



MOCCASIN-FLOWER

This design, representing one of the native plants most in need of protection, was made for the cover of the program of May 9, through the co-operation of the W.P.A.

Steele of the Bronx, both of whom used to work with Mrs. Britton; and Mrs. Harry A. Day of New York City, a former student of Mrs. Britton's when, before her marriage, she was a teacher at Hunter College.

Among them were the men and women of a younger generation, those who today are determined to save the best of the native flora from destruction at the hands of industrial and real estate developers, road builders, short-sighted growers who dig from the wild rather than to raise plants from seeds, and from thoughtless pickers who have not yet been trained in the proper attitude toward plants.

The co-operation of these enthusiasts will reinforce the New York Botanical Garden's program for wild flower preservation.

Elizabeth G. Britton And The Movement For The Preservation Of Native American Wild Flowers[1]

By C. Stuart Gager
Director, Brooklyn Botanic Garden

VISITORS to the plantations of the New York Botanical Garden during the first few years of its history became familiar with the figure of a woman walking with a rapid, somewhat nervous step, and giving one the impression that she had something definite on her mind and was in a hurry to reach some destination without undue delay. This was, in fact, usually the case, for the woman was Elizabeth Gertrude Knight Britton, wife of Dr. Nathaniel Lord Britton, the first Director-in-Chief of the Garden, and the destination she was hastening to reach was the spot where some citizen, imbued with the obsession that this is a "free country," but forgetting it is also a land of law and order, was helping himself to such flowers, or even entire plants and branches of flowering trees, as he saw growing in the Garden and loved so well that he decided he would take a few of them home with him.

Mrs. Britton usually reached her destination in time, and the precipitate encounter was usually one that the over-zealous lover of some one else's flowers would not soon forget. Mrs. Britton was fully justified in her zeal and her technique and her vocabulary. (I should add, parenthetically,

[1] Given May 9, 1940, at the New York Botanical Garden on the occasion of the dedication of a bronze plaque honoring Mrs. Elizabeth G. Britton for her interest and work in the preservation of native American wild flowers.

that she was always a lady in her manner and language at such times, and this, I believe, made what she said all the more effective.)

I say she was more than justified; for the amount of the vandalism in this botanical garden in its early years was almost beyond belief. Many a Sunday, in early spring, when I was in charge of the grounds, I saw more than a barrel-full of stolen flowers and branches taken from visitors who were leaving the Garden by the Third Avenue elevated railway entrance, and that was the condition at other entrances. These experiences made one almost despair of the possibility of ever being able to maintain a botanic garden open to the public.

There have been many changes since the year 1900; changes in dress, in habits, in words, and in standards of behavior. The stealing of flowers has become one of the minor vandalisms in the Brooklyn Botanic Garden, and I imagine the same thing is true at this Garden. Vandals nowadays manifest their appreciation of living in a free country not so much by the stealing of flowers, but by the smashing of park benches and fountains and statuary, and other more manly—or at least more muscular—types of declaration of independence.

The New York Botanical Garden was founded in the years when automobiles were as scarce as horse-drawn vehicles are now. But the rapid multiplication of motor-cars made it comparatively easy for "city folks" to get into the country in increasingly large numbers. Now it has always seemed difficult for city people to realize that the countryside is private property. Even self-respecting and law-abiding people from our cities have quite generally felt free to go into woods and fields and help themselves to fruits and flowers.

The automobile took more people to greater distances into the country than had ever before been the case, and it took a more miscellaneous type of person, including those whose idea of property rights was primitive, who had no more appreciation of the importance of conserving natural beauty and esthetic natural resources, such as wild flowers, than the early lumbermen had (or should I say have?) of forest conservation.

Wild Flowers Disappearing

The situation became so bad that numerous species of wild flowers disappeared almost entirely in suburban localities where they were formerly plentiful. The leading article in the January 1902 number of the Journal of the New York Botanical Garden, by Dr. Britton, stated as follows:

"The thoughtless and indiscriminate picking of flowers and breaking of twigs or branches from wild plants is an offense perpetrated by many persons who ought to know better. Every effort to educate people to realize that plants which are thus picked or broken cannot be enjoyed by others who follow them, is a distinct aid in

diminishing selfishness and in developing the more healthy taste to preserve natural objects rather than to deface or destroy them. In the vicinity of many of our cities and towns, wild flowers, once common, have become rare by such vandalism, so that the healthful pleasure and interest of woodland walks have become much less enjoyable."

Dr. Britton then announced that on August 29, 1901, the Misses Olivia and Caroline Phelps Stokes had presented to the New York Botanical Garden the sum of $3000, "on condition that the interest of this fund should always be used for the investigation and preservation of native plants, or for bringing the need for such preservation before the public."

The Stokes Fund and Its Effect

This gift was formally accepted at a meeting of the Board of Managers held October 23, 1901, and was officially designated as "The Olivia and Caroline Phelps Stokes Fund for the Protection of Native Plants." It was further voted that the annual income from the fund "be at present applied to the payment of prizes for essays upon the preservation of wild plants, including shrubs, herbs, and trees, and the publication and distribution of such essays." There were three prizes of $50, $30, and $20.

On the first announcement of these prizes there were twenty essays submitted in competition, and the three awards went to Dr. F. H. Knowlton, Miss Cora A. Clarke, and Dr. Abel J. Grout. The first prize essay, of Dr. Knowlton, had a final circulation of several thousand copies.

I have spoken of these essays in so much detail for it was undoubtedly Mrs. Britton who conceived the idea and who interested the Stokes sisters to establish the fund for the prizes.

Dr. Britton is authority for the statement that it was the distribution of Dr. Knowlton's essay that led to the establishment of the Wild Flower Preservation Society of America. (Jour. New York Bot. Gard. **3**:180. Oct. 1902). And so we may credit Mrs. Britton with being the prime mover (or at least one of them—if there can be more than one "prime mover") in the establishment of this society.

Early Wild Flower Societies

So far as I can ascertain, the first wild flower preservation society was established in England in 1884, when a Mrs. Ewing founded the Parkinson Society, named after the famous author of *Paradisus Terrestris*, the first work in English to describe and figure garden plants alone. The stated objects of this society were "to search out and cultivate old garden flowers, to plant waste places with hardy flowers, *and to prevent extermination*," thus bringing in the modern conception of conservation. On the death of Mrs. Ewing she was succeeded by Prof. Daniel Oliver. This society has since been dissolved.

The organization meeting of the Wild Flower Preservation Society of America was held in New York on April 23, 1902—almost exactly 38 years ago. Dr. Frederick V. Coville, of Washington, D. C., was the first president, and Mrs. Britton was elected one of the Board of Managers. Numerous chapters of the Society were established, and the New York chapter was incorporated under the name "Wild Flower Preservation Society of America, Inc.", so that when a meeting was held on December 28, 1924, to reorganize the "National Society," it was decided to adopt the name "The Wild Flower Preservation Society, Inc." Mr. Percy L. Ricker, Washington, D. C., was elected the first president of the new organization, and has held that office ever since. Mrs. Britton, who was elected a member of the executive committee, was also secretary of the New York Chapter. In his biographical sketch of Mrs. Britton, Dr. Marshall A. Howe very appropriately referred to her as "the motivating force of the organization." Shortly before Mrs. Britton's death the incorporated New York Chapter disbanded, largely due to Mrs. Britton's ill health and her consequent inability to carry the work. Its activities were turned over to the National Society under the presidency of Mr. Ricker.

For nearly 35 years—from 1901 until her death in 1934—Mrs. Britton was continuously active in preaching the gospel of native wild flower conservation, publishing papers, giving lectures, carrying on a heavy correspondence on the subject, talking about it whenever opportunity offered, and making opportunity when it was not offered. But she did more than "preach;" she got things accomplished. Public sentiment was aroused, laws were passed in various states, additional chapters of the Wild Flower Preservation Society were established and encouraged, and conservation activities promoted in garden clubs and public schools.

Some people have thought that the crusaders for the preservation of native wild flowers have been over zealous. Most crusaders seem over zealous to those who are not participants in the crusade. The need of zeal and the need of being eternally on the watch, even after there has been "a law passed," was never better illustrated than in the case of wild flower preservation.

Dangerous Amendment Proposed

I hold in my hand a copy of a bill introduced as recently as March 20, 1940, in the State Senate at Albany, N. Y., by Senator Rae L. Egbert, of Tompkinsville, Staten Island. This bill (No. 2510. Int. 1995), is entitled:

"An Act to amend the penal law, in relation to injury, destruction or removal of plant life or rock specimens." The law to be amended is Section 1, Subdivision two of Section fourteen hundred and twenty-five of the penal law, which prohibits the cutting down, injury, or destruction of fruit, shade or ornamental trees standing on the lands of another, and provides a penalty for anyone who "takes, picks, plucks, severs, carries away, removes, or injures, in a manner to kill or cause to die, or destroys any plant, shrub, tree or vine, of any wild or cultivated trailing arbutus," etc.

There follows an enumeration of some dozen or more wild flowers and ferns specifically protected by the act. The amendment proposed by Senator Egbert provides the following exceptions to the law:

"A person shall be permitted to take for his own use for study or teaching purposes, but not for sale or commercial use, specimens of plant life, rocks, minerals and fossils found on any public lands, highway or street. Such specimens shall not be removed in trucks or merchandise vehicles except by written permission of the conservation commission or where such specimens are part of the landscaping and notices of non-removal are posted. The conservation department may authorize the removal of such specimen upon proof that the removal thereof will not materially injure the land, highway or landscaping and that such specimens are to be used for study and educational purposes and not for sale or commercial use.

"2. This act shall take effect immediately."

If this proposed amendment became law, it would be lawful for any teacher, or even for any boy or girl in our public schools, high schools, and colleges, to help himself freely to any plants, flowers, shrubs, trees, or vines, growing in our botanic gardens, parks, streets, parkways, or any other public land. He might not take the material away in "trucks or merchandise vehicles except by written permission of the conservation commission," but he would be at liberty to fill several passenger automobiles if he desired to do so.

As a result of the letters and telegrams sent to Albany in opposition to this Act, the bill was not allowed to be reported out of Committee. But the mere fact that such a bill could get introduced, especially after nearly forty years of organized campaigning for the protection of our wild flowers and our parks, emphasizes the need of eternal vigilance, and of a program of unceasing public education.

Example of Diligence

In this matter of public education Mrs. Britton never tired. She herself was the author of fourteen articles on the subject, "Wild Plants Needing Protection," which appeared in the Journal of the New York Botanical Garden, with illustrations by Miss Mary E. Eaton. While Chairman of the Conservation Committee of the Federated Garden Clubs of New York State, Mrs. Britton urged a national boycott of American holly as a Christmas green, and she also promoted the propagation of holly by cuttings from Christmas decorations.[2]

The extensive bibliography of Mrs. Britton's published writings, compiled by Dr. John Hendley Barnhart for the Bulletin of the Torrey Botanical Club, January 1935, contains no less than thirty-two titles devoted to the conservation of our native wild flowers, and extending over a period of twenty-nine years, from 1901 to 1929, inclusive.

[2] Copies of one of Mrs. Britton's articles on Christmas greens are available for distribution at the Botanical Garden, and will be sent as a memento to any person requesting one.—C. H. W.

To Mrs. Britton belongs the credit of having first conceived and expressed the idea of the establishment of the New York Botanical Garden. (Jour. N. Y. Bot. Gard. **35**:101-102. May 1934.) So far as available records indicate, we may also say that to Mrs. Britton belongs the credit of having initiated the movement for the preservation of our native wild flowers, and giving it the momentum which resulted in its efficient organization on a national scale.

No memorial tablet was ever more willingly or more fittingly erected than the bronze plaque we dedicate this afternoon to the memory of Elizabeth Gertrude Britton.

*Elizabeth Gertrude Knight Britton As A Scientist**

By John Hendley Barnhart

WE are here to honor the memory of Mrs. Britton's valiant work in the field of wild-flower protection. But we must not forget that even when, from about 1926, she was most active along these lines, she did not entirely abandon the research to which she had devoted her leisure for so many years.

It was while she was teaching at the institution now known as Hunter College that Elizabeth Knight became actively interested in botany as a science, and especially in the study of mosses. She joined the Torrey Botanical Club in 1879, and was elected Curator of the Club's collections in 1884 and 1885. In 1883 she published the first of that long series of bryological papers that made her name familiar to students of mosses everywhere. When the last of these papers made its appearance, more than forty years later, their total number had reached one hundred and seventy. Some were only brief notes, but many were important contributions to the advancement of science. And the number rises to above two hundred if we include her signed reviews of the work of her bryological contemporaries; these reviews were always critical and often pungent.

In 1885 she became the wife of Dr. Britton. They were no doubt attracted to each other by their mutual interest in botanical study. No longer a teacher, she was able to devote more time to her favorite science.. In the years 1886, 1887, and 1888 she was editor of the Bulletin of the

* Presented at the New York Botanical Garden, May 9, 1940, at the program honoring Mrs. Elizabeth C. Britton.

Torrey Botanical Club, to which she contributed many of her most important papers in later decades. In April, 1888, the Torrey Club established a standing committee on the Cryptogamia of the local flora; she was one of the three original members of this committee, and was reappointed annually until her death.

In 1898, largely through her efforts, a society was formed devoted exclusively to the study of mosses; its organization was completed at the beginning of the following year. Known at first as the Sullivant Moss Chapter, its name was changed ten years later to the present one, the Sullivant Moss Society. She was of course one of the original members, and she always maintained her keen interest in its affairs. She was president of this society for the four years 1916 to 1919.

She is credited with the first suggestion, prompted by a visit with her husband to the world-famous Royal Gardens of Kew, that New York ought to have a great botanical garden, and to the efforts of Dr. and Mrs. Britton, more than of any other two persons, is due the establishment and development of the present New York Botanical Garden. From the time that the Garden collections were installed in the Museum Building, about 1899, she devoted some thirty years to study and arrangement of the moss herbarium. Through her influence many collections were acquired, the most important one being that of the famous British bryologist, William Mitten, which was purchased by the Garden for two thousand dollars, in 1906, shortly after his death. This was one of the richest of private moss herbaria in existence, and its incorporation with the Garden herbarium occupied all of Mrs. Britton's spare time for years.

She accompanied her husband on nearly all of his numerous botanical exploring expeditions to various tropical American islands, in this way visiting and collecting plants, particularly mosses, in Bermuda, the Bahamas, Puerto Rico, St. Thomas, Cuba, and Jamaica, and as far south as Trinidad. She thus contributed largely by her personal observations and field studies to the knowledge of the mosses of the Antillean region.

In 1912 the importance to the Garden of her voluntary services was given formal recognition by her appointment as Honorary Curator of Mosses, and thereafter she continued with this title the same work that she had done without it. Her published annual reports for the years 1914 to 1929, though brief, give a clear account of her scientific activities during this period. From what has been said it may readily be seen how fitting was the action of the Board of Managers of the New York Botanical Garden when, shortly after her death, they dedicated to her memory the entire moss collection of the Garden, designating it as the Elizabeth Gertrude Britton Moss Herbarium.

Botanical Lore From Korea

By Florence Hedleston Crane

IF you will go with me over the sea and far away to Southern Korea and open your eyes wide, to see the rare beauties of this most picturesque land, you will doubtless be interested in three mountains near "Gentle Heaven" (Soonchun), rising out of a broad plain of rice fields, and if this unusual formation seems strange to you, our Korean friends of the older generation can explain the matter easily.

The lore of Old Korea has a worthy giant who rivals Atlas in his exertions. We are told that this young giant, as a prank, lifted these three mountains up from the tops of the great Chiri Range and, balancing them comfortably on his great shoulders, started out across the fields. The sun rose hot, and the rocks began to roll off these mountain peaks, uncomfortably pelting his nose. Wearying of this adventure, he set these three peaks right down in the valley and left them there.

Ancient Korea not only had giants in those days, but great dragons as well! Now the dragon who lived and ruled beneath this lovely valley of rice fie'ds objected to this additional burden on his back, so he rose up and bit the top out of the hindermost peak!

* * * *

The Koreans have always been a very clever people, making the most of their limited resources. Their colorful costumes are truly a work of art. Before the appearance of rayon, they not only raised their own silkworms, gathering thousands of carefully grown mulberry-leaves necessary to satisfy these energetic little creatures, but spun and wove their own very beautiful silk, as one of the important routines of every well-ordered home. This, of course, is a woman's task, as is also the art of dyeing these yards of materials from native products, largely of vegetable concoctions. *Gardenia jasminoides* makes a very charming yellow dye, and, as we say in Korea, when a lady wears a bright yellow dress, "She must have used Gardenia dye"*. The numerous tints of azaleas (*Rhododendron poukhanense*, *R. obtusum*, *R. Schlippenbachii*, etc.) found over the hills in early spring, are the exact shades a Korean bride loves best for her trousseau. The strange green of the barley field in May is perfect for a little boy's coat.

The women's facility with vegetable dyes has served the Korean nation in good stead.

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* See "Flowers and Folk lore from Far Korea", Florence Hedleston Crane. (This book, which is handled by Macmillan in this country, may be consulted in the library of the New York Botanical Garden, in the Museum Building.)

In the sixteenth century, the great Japanese General, Hideoshi, and his army sailed over in wooden boats to capture the "Land of the Morning Calm," and built forts along the southern coast of Korea. One of the best preserved of these forts is located in an inland bay, just a few miles from the somewhat strategic town of Soonchun. The Koreans, under Admiral Ei, built their rocky fortress up a mountain side, but found themselves sadly outnumbered in "modernly" equipped and trained men, not to mention the lack of "up-to-date" (sixteenth century) dreadful war machinery! They were, however, always rich in ready wit. Admiral Ei divided his men into companies and sent for their wives, with their ever ready dye-pots. Thus it was that company after company of soldiers appeared upon the mountains—men in coats of bright yellow seemed to fill the hillsides; a few hours later, hordes of orange-colored uniformed

Right: Azaleas, or rhododendrons, which furnish some of the dyes for the trousseau of a Korean maiden. Below: The garden balsam, which with Korean girls tint their fingernails, according to a custom centuries old. These pictures are from the watercolor notebook of Florence Hedleston Crane, the wife of Rev. John Curtis Crane, a missionary, in which more than 700 native flowers of Korea are depicted. These and other paintings by Mrs. Crane were exhibited at the Botanical Garden in 1938.

soldiers appeared, followed, a little later, by companies in green, then by a battalion in blue; red-coats came, and finally royal purple uniforms illuminated the landscape! Little did their enemies suspect how this ingenious army apparently multiplied and re-inforced itself so rapidly!

Frightened, the invaders took to their boats, only to be met by an armadilla of hundreds of boats descending upon them, apparently equipped with thousands of well-armed men, carrying flaming torches, and shooting guns that exploded with a most terrifying noise! It was night — and of course they had no way of knowing that these horrible guns were in the hands of dummy men, and that the guns themselves furnished both noise and flame, as their bamboo stock burned until each successive joint exploded!

As the invading fleet hastily retreated, they forgot the dragon who inhabited the narrow straits, whose peace was disturbed by these unusual noises and frightful flames. Mr. Dragon rose up in his wrath, upset the boats, and thus peaceful Korea was saved by no more dangerous a weapon than the bamboo that is known as *Sasa albo-marginata,* which also protects almost every village of Southern Korea from the biting of winter winds!

* * * *

A favorite Korean riddle is: "What is it that wears a green skirt when young and a red one when grown? (This reverses the custom of Korean styles for women.) Of course the answer is the pepper (*Capsicum annuum*).

* * * *

Chinese say that Koreans are most "old-fashioned" as they wear styles that are three hundred years out-of-date! But the Koreans can say the same for the West, as this ancient story proves.

The balsam, or touch-me-not (*Impaticns balsamina*), gives a bright spot to Korean yards. It is planted inside the high rock walls which surround the homes, and around the rows of great jars of brown pottery where the bean sauce and pickles are kept (they call it "Kimchi"). This is the flower dearest to the young girls of the Land of the Morning Calm (Korea, or Chosen), today as it has been for centuries. It has supplied the dye with which they have tinted their finger nails through long ages. Using it is to them a real ceremony!

If the Honorable Father is alive, the dutiable daughter tints her thumbs; for her mother, she tints her index finger. The Honorable Elder Brother, if still living, claims the middle finger; the "ring finger" is called the "nameless finger", and so, until one is engaged, this fourth finger must not be gay. If she has younger brothers or sisters the little finger tells the story. Mark well, therefore, our sub-deb's hands, for there you will find her family secrets!

15,000 *Diatoms Deposited On Loan*

J. F. Burke Named Honorary Curator

THE GARDEN'S collection of diatoms has recently been enriched by the loan of 15,000 slides from Robert Hagelstem. The collection is methodically arranged and catalogued by species and localities, and about half of the slides bear named, selected species. A special room has been set aside on the third floor of the Museum Building, adjacent to the Mycological Department, so that students may consult the material readily.

Joseph F. Burke, who has been working for many months in arranging and cataloguing the Garden's own collection of 2,000 diatom slides, has been appointed Honorary Curator of the Diatomaceae, to have charge of the combined collections. Mr. Burke is a trustee and a member of the executive and publication committees of the Staten Island Museum, and is also Honorary Curator of Books and Minerals there. In addition, he is editor of the Bulletin, a member of the board of managers, and a past president of the New York Microscopical Society.

Characterized as a "capable student of the Diatomaceae," Mr. Burke spends much of his time in taxonomic studies of the group. The Hagelstein collection of which he will have charge includes the private collections of the late D. B. Ward and the late W. A. Poyser; "Les Diatomées du Monde Entier" by Tempère & Peragallo; the "Diatomacearum Species Typicae" by H. L. Smith; slides prepared by Mr. Hagelstein for his study and report on the Diatomaceae of Porto Rico and the Virgin Islands, published last year by the New York Academy of Sciences; and thousands of slides by other eminent students. There is also a wealth of such material as notes, photographs, negatives, lantern slides, and cleaned and uncleaned specimens.

In the same special room the Garden's collections of Myxomycetes, of which Mr. Hagelstein is Honorary Curator, will be placed with facilities for their study. A few years back, the collection of Myxomycetes in the herbarium consisted of about 2,000 specimens, mainly acquired from the late J. B. Ellis. Since then the Garden has purchased the collection of 3,200 specimens made by Dr. W. C. Sturgis. With the many specimens collected in the field by Mr. Hagelstein and his associates and the material obtained by exchange with other students, the entire collection has now grown to nearly 12,000 specimens, all arranged by species and catalogued.

The collection is rich in type material and authentic specimens determined by the authors of many of the species. There are thousands of specimens named by Arthur Lister, Miss G. Lister, Prof. M. Brandza, Prof. Charles Meylan, Prof. E. Jahn, Dr. G. A. Rex, Dr. C. H. Peck, A. P. Morgan, H. Wingate, H. Bilgram, Dr. W. C. Sturgis, Prof. T. H. MacBride, Prof. Y. Emoto, and many other students. The collection contains specimens also of the material distributed as *exsiccatae* by J. B. Ellis, M. Brandza, O. Jaap, and C. Torrend.

With these, the New York Botanical Garden probably has the largest collection of Myxomycetes in the country. The loan of the Hagelstein diatoms gives the institution access to a collection in this group which also ranks first among institutions in America.

The Garden's extensive literature relating to Myxomycetes and the Diatomaceae will be placed in the room with these two collections for the convenience of students.

Dr. Smith Named Curator At Arnold Arboretum

DR. A. C. SMITH, Associate Curator, is leaving the New York Botanical Garden Sept. 30 to become Curator of the Herbarium at the Arnold Arboretum, Jamaica Plain, Mass. He is taking the post to be left vacant by the retirement of Dr. Alfred Rehder July 1.

A graduate of Columbia University in 1926, Dr. Smith received the degree of Ph.D. there in 1933, doing his research at the New York Botanical Garden. Meanwhile, July 1, 1928, he was made a member of the staff as Assistant Curator, and was appointed Associate Curator three years later.

Since the beginning of his career Dr. Smith has been prominent in plant exploration in tropical regions. Immediately after his graduation he accompanied E. P.

Killip of the Smithsonian Institution on an expedition into Colombia, and again three years later on a trip which took them from Lima, Peru, across the Andes and down the Amazon to its mouth for the special purpose of studying plants used by the South American Indians as fish poisons. This expedition has had great economic as well as scientific consequences.

Dr. Smith spent nearly a year in Fiji in 1933-34 on a fellowship from the Bernice P. Bishop Museum in Honolulu, bringing back many thousands of herbarium specimens, some from plants collected on previously unexplored islands.

His next expedition to South America was in 1937-38 as botanist for the Terry-Holden expedition to British Guiana, with which he traveled far into the interior and crossed the border into Brazil, collecting plants in a region that had been explored only once before, a century ago.

In 1931 and '32 Dr. Smith spent six months doing research on his earlier South American collections in the principal herbaria of Europe. He again visited Europe as a delegate to the Fifth International Botanical Congress in Amsterdam in 1935.

He is the author of about sixty botanical papers, most important of which are his doctorate thesis on the Thibaudeae of the Americas and a 120-page monograph of the Myristicaceae. A similar work, now nearing completion, will cover the Hippocrateaceae of North and South America, a family that has persistently been neglected by botanists.

Dr. Smith is a member of the American Association for the Advancement of Science, Botanical Society of America, American Society of Plant Taxonomists, American Fern Society, and Torrey Botanical Club.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

The Earliest Known American Herbal

THE DE LA CRUZ — BADIANO AZTEC HERBAL OF 1552. Translation and commentary by William Gates. xxxii + 144 pages, illustrated with drawings from the original. The Maya Society, Baltimore, 1939. $3.75.

THE BADIANUS MANUSCRIPT, AN AZTEC HERBAL OF 1552. Introduction, translation and annotations by Emily Walcott Emmart. xxiv + 341 pages, illustrated in color. The Johns Hopkins Press. Baltimore, 1940. $7.50.

It is not the purpose of this reviewer to enter into the present controversy as to which of these two volumes is the "authorized" edition. These are matters which concern only the translators and their publishing agents. For us, it is of importance only that at the College of the Holy Cross at Tlaltelulco in the year 1552, one Martin de la Cruz, an Indian. illustrated and, in his native Nahual language, wrote an Aztec Herbal; and that the same year his friend and coworker, Joannes Badianus (also an Indian and a native of Xochimilco — then, even as now — the center of vegetable and flower culture in the Valley of Mexico) translated this manuscript into Latin. In fact, we are unable to join the partisan friends of either of the present commentators, personally rejoicing in having two presentations (in spite of their occasional differences in spelling and rendition) rather than the single edition which, in the ordinary course of events, might have been given us.

So far as the two volumes are concerned we feel that, to the average reader and student, the Emmart edition will be the more acceptable, for here the plates of the original manuscript with Latin text are presented in facsimile with their colored drawings as nearly like the original as the method of copying would permit. This is followed by a transcription of the Latin in modern type and a parallel English translation together with a wealth of notes. Even the paper used in this edition is a facsimile of the original Genoese material, bearing duplicates of the watermark in the paper used in the Badianus manuscript.

The Gates edition presents only copied line-drawings (not always too well rendered) with an English translation. The annotations, while not so voluminous as in the Emmart work are, none the less, interesting. In his introduction, Gates states that English translations were made by himself not only of the Herbal text, but also of the more extended Mexican works of Sahagún, Hernández and others. This undoubtedly led to inclusion of notes which we particularly like; notes on an Introduction to the Mexican Botanical System, Synonymy, Classification, Taxonomy, a Glossary and Iconography (this last taken mainly from the Codex Mendoza) which, although they do not bear directly on the text of the Herbal, serve as a background of understanding. However, we did not always relish the somewhat archaic botanical terminology occasionally used by this commentator.

On the other hand, the Emmart edition has a number of interesting introductory chapters, among them the ones on The Historical Background of the Manuscript, Illustrations and Symbols (this one containing a review of the pigments available to these early craftsmen-artists), Mythology and Medicine, Modes of Treatment, and a short but interesting chapter on Aztec Herb Gardens.

Naturally, in such works, the commentators are limited when they attempt to assign modern botanical equivalents of Mexican plant species to those named and pictured in the Herbal. In some cases there can be little doubt, particularly where the plant is reasonably well known and, in the Herbal, bears much the same name as that in use among the modern Nahua-speaking peoples. We feel, however, that both authors leaned a bit too heavily on bibliographic backgrounds rather than on the keen Indian eyes of Martin de la Cruz, the artist-herbalist, for in certain instances he has clearly indicated botanical features which rather definitely place occasional plants of which neither commentator has attempted more than casual identification; botanical features which anyone reasonably well acquainted with the Mexican flora would immediately recognize as indicative of particular families, or even genera. But this, for the lover of fine books, is of small moment and detracts nothing from our enjoyment of turning these pages, particularly of the Emmart edition, and feeling that here we have a link between the ancient and modern American botanists.

I have said this Herbal is a link between the old and new in American botany. This much we must realize: that the Aztecs were conquerors and usurpers in Central Mexico, having come in from the North, and that they built their culture on the basis of the more ancient and highly developed Toltec civilization already there. This, in turn, probably took its roots from the yet more remote civilizations which had developed to the southward in the highlands of Southern Mexico and Central America, civilizations which, long before the advent of the Aztecs, had an extensive *materia medica* based upon a broad knowledge of practical botany.

We are therefore thankful that "a certain Indian" (Martin de la Cruz) who had "no theoretical learning, but [was] well taught by experience alone" wrote and illustrated this work, and that his friend "Joannes Badianus, an Indian by race, a native of Xochimilco, reader at the same college," translated it into Latin, thus giving us our earliest known American work in botany.

W. H. Camp.

Empires Bow to Erosion

VANISHING LANDS. G. V. Jacks and R. O. Whyte. 332 pages and 33 illustrations. Index and annotated table of contents. Doubleday, Doran, New York, 1939. $4.

In a strongly written appeal to heed the dangers of soil erosion and to do something about it the authors have given the reader a world-wide view of the whole problem and intelligent analyses of all its phases. In the first chapter a scholarly approach introduces us to the fundamental contrast between benign geologic denudation and the devastating soil erosion of modern days. Civilizations have risen and fallen because of soil mismanagement and great empires have bowed to soil erosion.

After a far-reaching survey of soil erosion around the world, region by region, a study of erodibility of soils is made. This is followed by an exposition of the principles of soil conservation and the story of their incorporation into the modern techniques of farming. The application of these principles in preventing gullying; in the management of pasture, range and veld; in the control of dust,

dunes and deserts; in the conservation not only of soil for trees and crops, but of water and wild life resources, is urged by the authors as the very first requirement of economic, political and social progress and peace. The social aspects of soil erosion are dwelt upon at length with telling effect. Finally factors and trends in our modern society, which affect conservation are discussed and summed up.

In their treatment of the subject I should like to state without hesitation that the authors show a broad familiarity and have dealt in a masterful way with soil erosion problems. Any ordinary reader picking up the book can readily understand the subject matter and at the same time may rely on the information given. In all respects this book with its driving tale of disaster from erosion and its drumming persistence is to be commended and recommended.

W. M. PORTERFIELD,
Soil Conservation Service,
United States Dept. of Agriculture.

Shrubs for Discerning Gardeners

WALL SHRUBS AND HARDY CLIMBERS. W. J. Bean. 182 pages, illustrated and indexed. Macmillan, New York, 1940. $2.25.

Mr. W. J. Bean, one of England's leading authorities on trees and shrubs, has written on a phase of gardening in which an increasing enthusiasm is developing both abroad and in the United States. In the first 24 pages the book deals with cultivation, methods of support, pruning, and various types of climbers and wall shrubs. The remaining 148 pages consist of a descriptive list of climbers and wall shrubs that have been found suitable in England.

Many plants lacking in hardiness in exposed situations can be grown against a wall with a fair degree of success. In England, particularly in the south portion, wall shrubs include choice plants from such regions as South America, New Zealand, Australia and Southern California, which would be useless to try in the region of New York. Further southward along the coast and in Florida, many would be worthy of a trial.

Descriptions of the plants include many personal references which usually add to the usefulness and enjoyment of the book. Not all the subjects included are tender, and many good hardy shrubs which can be trained as climbers are described with sufficient information to enable the gardener to decide whether and how these choice plants may be grown.

Where there are numerous walls to cover or where a gardener is seeking interesting effects with woody plants, this book will provide the best information obtainable.

RALPH PINKUS.

Meeting the Wild Flowers Where They Grow

WILD FLOWERS OF THE NORTHERN STATES AND CANADA. Arthur Craig Quick. 518 pages, 8 colored plates, 234 line-drawing figures. Illustrations by Constance Stampell. M. A. Donohue & Co., Chicago and New York, 1939. $4.

The author leads his readers on weekly rambles through parts of the dune region on the shores of Lake Michigan. The walks begin in the first week of April and continue through the fourth week in October, during the course of which some 600 wild plants are described in popular and entertaining fashion.

H. N. MOLDENKE.

Notes, News, and Comment

Waterlilies At Fair. Again this year the New York Botanical Garden is showing three pools of aquatic plants in Gardens on Parade at the New York World's Fair. The hardy waterlilies are expected to begin blooming in early June, to be followed in midsummer by tropical varieties, both types accompanied by a number of other water-loving plants.

Photographs. At the tenth annual convention of the Biological Photographic Association, to be held in Milwaukee Sept. 12-14, a group of photographs made by Fleda Griffith at the New York Botanical Garden will be a feature of the salon. It will include photographs of the under side of the leaf of *Victoria regia*, some of which appeared in this Journal last December, and pictures taken when the Garden's largest specimen of *Amorphophallus titanum* bloomed in June 1937.

Science Congress. Dr. H. W. Rickett represented the Torrey Botanical Club at the eighth American Science Congress in Washington, D.C., May 10-18.

Virginia. Dr. W. H. Camp spoke before the joint session of the geological and biological sections of the Virginia Academy of Science on "Continental Displacement and its Relation to the Origin and Dispersal of the North American Floras" at Lexington the afternoon of May 3. In the evening he gave the invitation address before the academy on "Plant Exploration in Southern Mexico."

Guests. Members of the Woman's National Farm and Garden Association, assembled in New York for their annual meeting last month, were the guests of the New York Botanical Garden May 24 at the tea given by the President, the Board of Managers, and the Advisory Council of the Garden. More than 200 attended, among them Mrs. Henry Ford, President, Mrs. Francis King, horticultural writer of note; and Mrs. Walter Douglas, a member of both the Association and the Garden, who had charge of the visit to the Garden. After a tour of the Main Conservatories, the Perennial Border maintained by the Advisory Council, and the Thompson Memorial Rock Garden, tea was served on the mezzanine in the Museum Building, with officers of the Advisory Council as hostesses.

Student Gardener. Samuel Bridge, who was graduated from the Science Course for Professional Gardeners in April 1939 and was appointed exchange student gardener for the Royal Botanic Gardens at Kew that same year, becomes assistant gardener on the estate of Mrs. Elon Huntington Hooker at Greenwich, Conn., June 10. Mr. Bridge was obliged to leave England on account of the war after only a few months at Kew, and has been at the New York Botanical Garden since his return.

Lectures and Trips. At the annual meeting of the American Rock Garden Society in Greenwich, Conn., May 20, T. H. Everett spoke on "Plant Hunting in the Rockies." Mr. Everett is First Vice-president of the society. Walter D. Blair of Tarrytown, a member of the Garden, was elected President this year.

The Hunt's Point library and Harrison Garden Club heard talks last month by Elizabeth C. Hall on "A Day at the New York Botanical Garden." On May 26 Miss Hall led a field trip of the Torrey Botanical Club around Westbrook, L. I. Dr. H. N. Moldenke led Torrey trips on April 22 at the Bartlett Tree Research Laboratories (with Dr. S. W. Bromley), on May 25 in the Watchung Mountains, and May 26 around Seeley's Notch, Scotch Plains, N. J.

Guest. Dr. William J. Robbins was a guest of honor at a lecture on "Birds of America," given with sound and color by Dr. Arthur A. Allen of Cornell University before the City Gardens Club of New York the evening of April 25.

New Plantings. In the collection of rhododendrons being developed north of the Thompson Memorial Rock Garden, about 80 evergreen species and varieties are expected to flower between June 1 and 15. There is in addition a new rhododendron border just inside the fence on the west side of the grounds.

A new border of peonies, containing nearly 100 varieties interplanted with lilies, is flowering this month near the Main Conservatories, between the southeastern end and the Perennial Border of the Advisory Council.

A new collection of young lilac bushes, the propagating stock of which was received from the Rochester Park Department and from the Havemeyer estate, has been set out between the road and Main Conservatories, on the west side of the grounds. It includes 70 French hybrids and about 35 Asiatic species and varieties, most of which came into flower late in May.

Current Literature At a Glance*

By Virgene Kavanagh

National Parks. New bulletins describing the attractions of Hot Springs, Grand Canyon, Mesa Verde, Zion, and Carlsbad Caverns National Parks have been issued by the U. S. Department of the Interior. These include directions for reaching the parks by motor, train, bus or plane, a description of hotel, cabin, and camp ground facilities, usually with rates, and a list of special lectures at some of the parks.

Trees and Shrubs. "Care of Ornamental Trees and Shrubs" is the title of a new U.S.D.A. Farmer's Bulletin (No.

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* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

1826) which helps the home gardener solve many of his problems, such as the selection of trees and shrubs adapted to his locality, preparation of the site for the plants, setting them out, cultivating and fertilizing them, pruning and training them, and protecting them from pests. A section is devoted to the special requirements of plants such as rhododendrons, hollies, hydrangeas, lilacs, umbrella-trees, and weeping trees. This bulletin, prepared by F. L. Mulford, is available for ten cents from the United States Department of Agriculture, Washington, D. C.

Preserved in Glass. Biological specimens for study and display have been successfully embedded in "plexiglas" by Dr. Charles E. Sando of U. S. Department of Agriculture. The technique is still too complicated for the amateur and the material has not yet been made available, but several details of the method which may lead to its wider use are given in *Science Observer* for May 1940.

Shade Trees. A brief summary of the data collected during the Cleveland Shade Tree Census 1939 appears in the April number of the *Arborists' News*. Although 105 species of trees were found growing in Cleveland, almost half of the 118,000 trees there were maples. Sycamores (plane trees) and elms ranked next in number. In that region elm trees were infected with disease less frequently than maples or sycamores.

Insects and Bugs. Termites are related to cockroaches rather than to ants, according to an article in the September 1939 number of *The Arboriculturist*. Termites attack dead or dying wood in living trees and spread fungous diseases which cause further injury. Arsenical dusts may be used in termite runways to control the pests.

Mushroom Culture. Amateur mushroom growers in the United States will enjoy comparing experiences with those of growers in the Union of South Africa. Miss A. M. Bottomley has prepared a bulletin, (No. 210), on "Intensive Mushroom Growing for the Amateur" for the Department of Agriculture and Forestry.

Mrs. A. Sherman Hoyt Active In Desert Conservation League

Life Member of Botanical Garden Once Presented Cactus Group For Conservatory Display

MRS. A. SHERMAN HOYT of South Pasadena, Calif., who in 1928 presented to the New York Botanical Garden a collection of about 50 characteristic species of plants from the southwestern desert arranged with sand, stones, and examples of animal life in a naturalistic setting, has continued with unremitting zeal her interest in the native flora of the desert and its conservation.

The cacti and other desert plants, which were placed on display against a realistically painted background erected in the conservatories, had previously been shown by Mrs. Hoyt at the International Flower Show in New York, primarily in behalf of the Conservation Committee of the Garden Club of America, in an effort to stimulate interest in the protection of the beauties of the American desert regions.

Public interest was aroused, largely through Mrs. Hoyt's work, and today she continues as President of the International Desert Conservation League, an organization she founded about ten years ago.

The Botanical Garden greatly regrets that an error in office routine caused an asterisk to be placed beside the name of Mrs. Hoyt in the list of life members published in the Director's Annual Report, in Section 2 of the Journal for May 1940. The footnote accompanying the asterisk indicated that Mrs. Hoyt had died during the past year.

Mrs. Hoyt, however, is alive today and as active as ever in the preservation of the remarkable flora of the deserts. In a forthcoming number of the Journal it is hoped that Mrs. Hoyt will tell about her conservation work and what it has done to keep the deserts blooming for the pleasure of the traveler and the joy of visitors in the future.

THE NEW YORK BOTANICAL GARDEN

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Elon Huntington Hooker, Chairman; Mrs. Carl A. de Gersdorff, First Vice-chairman; Mrs. William A. Lockwood, Second Vice-chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

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CAROL H. WOODWARD, Editor
July, 1940

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TOWARD A PERPETUAL GARDEN

"For nearly fifty years the New York Botanical Garden has been meeting the needs of those who are interested in plants. It maintains a staff trained in horticulture and in the breeding, classification, physiology, and diseases of plants. It has a large library—one of the largest in the world devoted entirely to horticulture and botany under the supervision of a librarian trained in horticulture and a bibliographer. It has the largest collection of preserved plants in the Western Hemisphere. During many months of the year the visitor may see extensive plantings of trees, shrubs, flowers, and ferns growing in a variety of situations, all carefully placed and accurately labeled. The great conservatories provide a means of maintaining large collections of exotic plants the year around—a perpetual garden for the plant-lover.

"The maintenance of such an institution depends in part upon public generosity and individual contributions."

These two paragraphs are quoted from the pamphlet issued this month by the New York Botanical Garden. They partially explain the Garden's need in seeking new members—new supporters—from among "those who are interested in gardening, in the enjoyment of flowers, in the study of plants."

The Garden "appeals for memberships and gifts," the pamphlet continues, "from all who believe that a botanical garden is indispensable for the human satisfaction and knowledge engendered and dispersed."

In the present state of world affairs, with the energies of so many people, including citizens of the United States, absorbed in Red Cross work and other relief and defense activities, it is imperative that institutions of the character of the New York Botanical Garden be maintained in effective working condition. In our absorption with the international situation, we should not lose sight of the wisdom of maintaining human satisfactions which are not immediately associated with the present crises but which have their permanent place in human welfare.

The New York Botanical Garden will welcome Journal subscribers as members, and asks that both they and the present members send in the names of persons who would appreciate receiving a personal invitation to membership.

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York, N. Y. Entered at the Post Office in New York, N. Y., as second-class matter. Annual subscription $1.00. Single copies 10 cents. Free to members of the Garden.

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Pest-Proof, Fool-Proof, All-Purpose Roses

"WHY aren't species roses used more frequently in the garden?" asks C. R. McGinnes of Reading, Pa. Mr. McGinnes, who is a business man, devotes his spare time to the cultivation of what is said to be the largest private collection of roses in the United States—more than 2,000 varieties and 5,000 plants. The main garden alone contains more than 2,000 plants, and there is a garden of old Tea roses of more than 100 varieties which have been collected over a period of many, many years. In another garden are 300 varieties of Hybrid Teas, most of which are out of commerce. Climbers are planted for a distance of about five hundred feet on each side of an old stone fence. The attention his garden demanded prevented his speaking in person at the New York Botanical Garden's Rose Conference last June. Instead, he sent the paper below, which is being published here for the first time.—C.H.W.

Some Outstanding Species Described
By C. R. McGinnes

SURELY there is no good reason why these lovely wildings, the species roses, are not better known. Practically all of them are hardy in this latitude; many of them are bug-proof, blight-proof and nearly fool-proof, and will grow almost anywhere with as little attention as any plant used for outdoor culture. Their uses are varied and they are suitable for more garden purposes than almost any other shrub. They can be used where there is shade, in sun, in a border, or in the rock garden; for covering barren banks, stone walls, and even the side of a house, and practically all except the strong climbers are suitable for shrubbery plants or as individual specimens.

I will list briefly the characteristics of some of the outstanding sorts

among the more than two hundred which we have in our garden at this time. Starting with the earliest ones, the yellow group, we have *R. Ecae,* then, about three days later, *R. primula.* Both roses are very beautiful shrubs about six feet high. There seem to be two different roses under the name of *R. Ecae,* one discovered by Aitcheson in Afghanistan, the other named by Dr. Rehder. The latter has recently been changed to *R. primula,* although Beckwith maintains that it is a variety of *R. xanthina* known as ***Kokanica.*** The flowers of the former are deeper in shade than the latter, both being a light yellow; the foliage is identical except that *R. primula* has an odd fragrance, something like Scotch whiskey.

The next group of yellows contains *R. Hugonis, R. xanthina* and *R. xanthina spontanea,* besides two roses which are catalogued as *R. cantabrigiensis* and *R. hispanica.* These all bloom within four to six days after *R. Ecae.* All have a similar type of foliage, but of this group the best known one, of course, is *R. Hugonis.* Some think this is the loveliest of all species. It is lovely, but is not nearly as graceful as *R. xanthina spontanea,* whose flowers are much deeper in color, almost exactly the shade of the Hybrid Tea Rose, ***Goldenes Mainz,*** (or ***Golden Main***) the yellowest of all yellows.

There is a hybrid given me by the late G. A. Stevens from Breeze Hill Gardens, which is unusually lovely. It is a cross of *R. Hugonis* and *R. spinosissima altaica,* by Dr. Van Fleet. The flowers have five regular overlapping petals, something like light yellow waterlilies, three to four inches in diameter, and they completely cover the canes from top to bottom. Why it has never gotten into commerce is a mystery.

Among the roses most suitable for shrubbery, I would list first *R. spinosissima altaica.* It reaches a height of six feet, blooms about eight days after *R. Ecae,* and lasts through the month of May, with very large showy lemon-colored blossoms, three and one-half inches in diameter, followed by black fruits. Another outstanding Scotch rose is *R. spinosissima* ***Maxima Lutea,*** like the ***Austrian Yellow*** in color, but of better growth, also with black fruits.

R. hibernica, the "wild Irish rose", is as lovely as one would expect from a rose so famous in song and story. It has large single pink blossoms on a vigorous bush; the blossoms usually cover the entire plant.

Members of the *omeiensis* group are striking and unusually attractive, not only on account of their fern-like foliage, but also because they are armed with the most wicked-looking thorns of any of the species. They would probably make an impenetrable hedge. The varieties *pteracantha* and *chrysocarpa* have immense red translucent spines which almost join along the graceful branches. The flowers are white, with only four petals, followed by both red and orange fruits.

R. acicularis (which is also known as *R. Sayi*), a Rocky Mountain

species, has not found its way into commerce in this country but enjoys one distinction. It is most unusual in the color and scent of its flowers, which are pale lavender with decided lavender fragrance. The scent is more pronounced in dry seasons than when we have plenty of rain, and the flower is unbelievably attractive.

Micrugosa is a hybrid made with *R. rugosa* at the time when the present *R. Roxburghii* was known as *R. microphylla*. It is a dense shrub up to six feet high, with pale blush flowers up to five inches in diameter, similar to the Australian Climber, ***Daydream.***

R. graciliflora is well named, for it has locust-like foliage on gracefully arching branches covered with dark pink flowers in May.

R. foetida bicolor (*R. foetida* x ***Austrian Briar***) has most striking nasturtium and scarlet cupped flowers with yellow reverse.

R. rubrifolia and its hybrid, ***Carmenetta,*** have grayish red foliage, which make a fine contrast in shrubbery.

One English authority considers *R. pomifera* (also listed as *R. villosa*) known as Wolley-Dod's rose, as the most beautiful of all species. It is very, very lovely, but there are others whose habit I like better.

In order to enjoy their beauty to the fullest, they should not be crowded, and each individual plant should be given space to develop.

Everblooming Species and Some Hybrids

There is an unusual everblooming shrub called ***Karl Forster*** which was derived from *R. spinosissima altaica* and ***Frau Karl Druschki.*** Nature wasn't very natural when this cross was made, for neither parent blooms more than once or is very fragrant, yet ***Karl Forster*** is very fragrant, has flowers like ***Druschki*** produced until heavy frost; also the first double flowers of the season — coming about a week later than *R. Ecae.*

Another everblooming hybrid is ***Schneezwerg*** (which we are translating here into ***Snow Dwarf***) — the best of the hybrid rugosas. Its combination of rugosa foliage, large white single fragrant flowers, and red fruits is most unusual.

The best known everblooming species are *R. chinensis mutabilis* and *R. rugosa* and their hybrids. Several others, *R. Setzerii, R. Fedtschenkoana, R. Coryii,* and *R. virginiana plena* (*R. rapa*) are catalogued as being more or less remontant, but have done very little after the first crop of blooms, at least so far, in our garden. *R. mutabilis* is absolutely everblooming and bears flowers at the same time all the way from a pale straw color to a dark crimson. It could be used for any purpose that Polyanthas are. It has also been catalogued under the name of ***Chamois*** by Kordes and by one American nurseryman.

R. davurica is a Manchurian species which makes a dense shrub, 6 to 7 feet high. The foliage is small and attractive, but the pinkish-purple flowers are not.

"Rock 13495" is one of the most distinctive, standing 6 to 7 feet high with almost thornless canes. The brilliant red, white-centered flowers, 2½ inches broad, are followed by large pear-shaped crimson fruits which ripen early.

Thornless Species

The best known thornless rose is *R. pendulina* (*R. alpina*). It is absolutely thornless, and the dark red single flowers appear almost as early as *R. Ecae,* and bloom over a long period.

R. Banksiae Morletti (known also as *R. inermis Morletti*) is a semi-double red. From where I write I can see a spray at least fourteen feet up an apple tree under which it is planted.

R. saturata, R. morica and "Rock 13495" are also thornless except at the base of old canes.

With Ornamental Fruits

Those with the most striking hips and seed pods are *R. highdownensis,* "Rock 13495", *R. nutkana, R. Hillieri,*[1] *R. blanda, R. Soulicana, R. spinosissima altaica* (black fruits), *R. oxyodon* and *R. haematodes* (with bottle-shaped scarlet fruits).

Climbing Roses

I would say the most satisfactory among the climbing types that we have is *R. Hillieri*[1] (a hybrid between *R. Moyesi* and *R. Wilmottiae*). It attains a height of about nine feet, and is the darkest of all single roses, being slightly darker than ***Hawlmark Crimson.*** It has lovely fine locust-type foliage with a strong spicy fragrance. The flowers are mildly fragrant. In my opinion it is the most beautiful of all climbers.

R. Brunonii, from the Himalayas, is about twelve feet in height. One English authority says this has the most beautiful foliage of any species —for it is fern-like and of a light grayish green color. The white flowers, borne in large clusters, are intensely fragrant.

R. Soulicana, a fine Chinese species, has lemon-colored flowers with a yellow center, in large corymbs; it blooms late, is very attractive, and bears immense clusters of red berries in fall.

R. laevigata, the Cherokee rose, is not hardy in the north, but it is worth trying on the south side of a wall for its handsome almost evergreen foliage; it has large single white flowers with yellow centers, four to five inches in diameter. We have wintered successfully both the white and red Cherokee roses in Pennsylvania.

[1] In Rehder's new Manual (1940) *R. Hillieri* is given as a synonym of *R. pruhoniciana.* This and the other footnotes have been inserted by authorities at the New York Botanical Garden.

R. setigera, the only climber among American species, enjoys two distinctions — it is the last to flower among the species, and is the grandfather of a fine new race of hardy climbers, developed by M. H. Norvath.

R. clinopylla (formerly known as *R. Lyellii*)[2] is a very rampant climber with white flowers in trusses, with musk fragrance.

R. odorata gigantea should be mentioned I think as it has had more publicity and discussion than any other climbing rose in the last few years, several well-known hybridizers having spent years of effort with more or less satisfactory results. The foliage is beautiful, glossy, and almost evergreen. However, we have had a plant of one of its hybrids, ***Collett,*** since 1928; it has attained a height of ten feet, yet we have never had a single blossom, as it freezes down to the ground, no matter how mild the winter.

Glossy Foliage

Among the species of roses having glossy foliage, the most attractive are *R. cerasocarpa, R. glomerata, R. lucens erecta,*[3] and *R. blanda;* however, the best known is *R. Wichuraiana.*

American Species

Last I come to the wild roses of our own continent. Not being a botanist I will attempt no taxonomical discussion of their various differences. Those interested would do well to read Dr. Erlanson's scientific yet interesting article on American Wild Roses in the 1933 Annual. She lists thirty-four species found on this continent of which we have twenty-four in our garden. Among the most interesting is *R. nitida,* or the "shining rose" of Newfoundland, eighteen inches high, with glossy foliage that colors gorgeously in autumn, suitable for edging or rock gardens.

R. kamtchatica likely has the most northern habitat of any species, as it is found above the sixtieth degree of latitude in Alaska and Kamtchatca. We have two plants, one from England, and the other from the University of Michigan Botanical Gardens. They have the same foliage and habit but the flowers of one are light pink while on the other they are dark pink.

R. Montezumae, from Central Mexico, has the most southerly habitat, between the tenth and twentieth degrees of latitude. It is entirely hardy, and is covered with flowers and foliage similar to *R. canina.*

R. arkansana, a vigorous shrub, reaching a height of four feet, has the most fragrant pink flowers of any American species.

[2] Beckwith's catalog and Miss Willmott's "Genus Rosa" both mention *R. clinophylla* and *R. Lyellii* as separate species, but they are considered as one by Rehder in the 1934 and 1940 editions of his Manual. Rehder says, however, "probably not hardy;" a statement not borne out by Mr. McGinnes' experience.

[3] In Rehder's new Manual (1940) *R. lucens* is given as a synonym of *R. longicuspis,* but it is not known whether "*R. lucens erecta*" mentioned here is referable to this species or not.

R. Schuettcana and *R. michiganensis* are hard to separate; the stipules of both have bright red midribs.

R. blanda has bright red hips and highly colored fall foliage.

R. stellata and its variety *mirifica* from New Mexico are the most distinctive of any American species or natural varieties, with their minute foliage and dark red cupped flowers produced freely until mid-summer.

There are many other worth-while species but I believe I have covered the most useful and interesting ones in our collection. I feel it should be the privilege and duty of members of any horticultural organization to help to make them as well known as they deserve to be.

The Strange Case Of Coles vs. Culpeper

By Albert E. Lownes

IN the annals of science, neither Nicholas Culpeper nor William Coles occupies a conspicuous place, but in the middle of the seventeenth century they were reckoned among the leading English herborizers and, as exponents of the two philosophies that sharply divided contemporary opinion, they deserve some notice.

Culpeper was the older. He was born in 1616 and about 1640 he set himself up as an astrologer and apothecary in Spitalfields. A few years later he committed the unpardonable sin of publishing an unauthorized English translation of the *Pharmacopoeia,* so that any good dame could go out into the woods and fields to gather herbs and compound her own remedies. Needless to say, his name was anathema to the orthodox medical men of the time, but Culpeper had a ready tongue and he missed few opportunities to retort in kind. His books rapidly became best sellers and edition followed edition down to our own day. No English herbal begins to approach his in popularity, but Culpeper did not live to enjoy his fame. He died in 1654, only five years after the publication of his first book.

Culpeper believed the herbs and the diseases that they were supposed to cure were influenced by the heavenly bodies. This is a very ancient belief, but it received new life in the sixteenth century from the writings of Paracelsus and Giambattista della Porta.

Unlike Culpeper, Coles (or Cole, as his name was spelled by those who wrote about him in the seventeenth century) was an educated man. Born

ERRATA.

PAg. 12. l. 18. for Mr. *Robert Gardiner*, r. Mr. *Bobart Gardiner*, for *Payſick*, r. *Phyſick*. p. 16. l. 6. for *Agrimonies*, r. *Anemones*. p. 24. l. 4. for *ended*, r. *endued*. p. 39. l. 6. for *Robert*, r. *Bobart*. p. 48. l. 4. for *are*, r. *if*. p. 139. l. ult. for *politique*, r. *prolifique*. p. 141. for *Anomaticall*, r. *Anatomicall*. p. 156. l. 23. for ἓξ r. ὦ. p. 166. l. 14. for *vanity*, r. *vacuity*. Other literall faults the Reader is desired to mend with his pen.

AN
INTRODUCTION
TO THE
Knowledge of Plants.

CHAP. I.
Of Simpling, its Antiquity, Dignity, Pleaſure, and Uſefulneſſe in Phyſick, &c.

SImpling is an Art which teacheth the knowledge of all Druggs and Phyſicall Ingredients, but eſpecially of Plants, their Diviſions, Definitions, Places, Differences, Deſcriptions, Names, Times,

B

The first page of the Coles book of 1656, with the list of errata which was printed on the back of the preceding page, but which was omitted, with the four-page signature containing the dedication, in the issue of the following year.

in 1626, he had degrees in arts and divinity from Oxford. In 1656 he published a tiny duodecimo, "The Art of Simpling," which was followed in 1657 by a folio, "Adam in Eden." He died in 1662.

To Coles, Culpeper's astrological beliefs were sheer nonsense. He supported the doctrine of signatures. Many plants, according to Coles, carry signs that indicate their use. Plants with heart-shaped leaves cure diseases of that organ. Plants with jointed pods or roots are sovereign against scorpions. Flowers shaped like insects will soothe their stings. Of course, many other plants of undoubted virtue had no signatures, but

Coles explained that it was not God's purpose to make things too easy for the herborizer—*He* merely pointed the way. It is interesting to note that the doctrine of signatures was introduced by Paracelsus and carried to its highest point by della Porta. They considered signatures and astrology as complementary, but by the middle of the seventeenth century, each had enthusiastic adherents. Today both are as dead as their proponents.

Coles' books enjoyed no such popularity as Culpeper's. A single edition of each sufficed. Both works are scarce and *The Art of Simpling* is so rare that no copy exists in any important American library. This is unfortunate indeed, for it is one of the most interesting and readable of the old herbals. Coles wastes no time describing plants. He takes it for granted that the reader either knows them or that he has a book that illustrates them. Anyhow, his own larger book, *Adam in Eden,* "is well nigh finished and I hope will be shortly ready for the Presse." Coles' style is direct and colloquial. He is one of the first to use the "plain English", soon to be advocated by the budding Royal Society,[1] and his book is so filled with pithy sayings, folklore, and proverbs that it is hard to resist a temptation to quote at length. A single sentence must suffice:

"Come into the field then, and as you come along the streets, cast your eyes upon the weeds, as you call them, that grow by the walls and under the hedge sites, and it will be an hundred to one if you do not find there Verveine." One of our modern naturalists could have written that. Compare it with the opening words of a contemporary book, also by an Oxford man, on the same subject:[2]

"Avoiding the Prolixity and tediousnesse of a Proemiall Discourse (Brevity being here intended) thou mayest first consider the *Quid fit* of Phytologie; which is the Art of knowing and finding out the Temperature, Vertues and Use of Plants, as serving to the Curation or Sustentation of the Body; as also of their Danger; and the Remedies thereof." Lovell rarely uses an Anglo-Saxon word if he can find a Greek or Latin polysyllable.

We pick up Coles' little book once more with a distinct feeling of relief. The 123 pages that he devotes to simpling are packed with information. Much of it is evidently gathered first-hand, but he includes a chapter, "Of Plants used in, and against Witchcraft," and one on "Other Traditions

[1] They have exacted from all their members, a close, naked, natural way of speaking; positive expressions; clear senses; a native easiness: bringing all things as near the Mathematical plainness as they can: and preferring the language of Artizans, Countrymen, and Merchants before that of Wits or Scholars.—Sprat. History of the Royal Society. p. 113. 1667.

[2] Robert Lovell's *Pambotanologia,* Oxford, 1659.

On the opposite page:

Four pages from the 1656 edition of "The Art of Simpling," showing Coles' opinion before he met with the illustrious Elias Ashmole.

CHAP. XXV.

Directions for the gathering of Plants, and keeping of them after they are gathered.

AND now I have done with the ſetting of Plants, give me leave to ſpeak ſomewhat of the gathering them alſo: Some of the Antients, and divers Moderne Writers which have profeſſed Aſtrology, have noted a Sympathy between the Sunne, Moon, and ſome principal Starres, and certain Plants, and ſo they have denominated ſome Herbes Solar, and ſome Lunar, and ſuch toyes put into great words. Amongſt which Maſter *Culpeper* (a man now dead, and therefore I ſhall ſpeak of him as modeſtly as I can, for were he alive, I ſhould be more plain with him) was a great Stickler; And he, forſooth, judgeth all men unfit to be Phyſitians, who are not Artiſts in Aſtrology, as if he and ſome other Figure-

Figure-ſingers his companions, had been the onely Phyſitians in *England*, whereas for ought I can gather, either by his Books, or learne from the report of others, he was a man very ignorant in the forme of Simples. Many Books indeed he hath tumbled over, and tranſcribed as much out of them, as he thought would ſerve his turne (though many times he were therein miſtaken) but added very little of his owne. But to paſſe by that, how did he thinke (if Aſtrologers onely can gather Herbes) that a man might cure himſelfe for three pence charge? Did he thinke any one could make a journey to an Aſtrologer for three pence? Yet I perceive him to be a very indifferent man. for he ſaith in his *Engliſh Phyſitian enlarged*, where he treateth of gathering Simples, Let the Planet that governes, &c: if they can, in herbes of *Saturne*, let *Saturne* be aſcendent, let the *Moon* apply to them by good aſpect, and let her not be in the Houſe of their Enemies; if you cannot well ſtay till ſhe apply to

them, let her apply to a Planet of the ſame triplicity; if you cannot waight (ſure he or the Printer had not learned to ſpell) that time neither, let her be with a fixed Starre of their Nature, and truely he might as well have ſaid, if you cannot ſtay till then, you may gather them at any time. But I ſee Maſter *Culpeper* can allow much Superſtition in himſelfe as to Starre-gazing, though he railes at it ſo vehemently, in Herbariſts of former times, for naming Plants. Now to proceed to the Directions.

And firſt, Though I admit not of Maſter *Culpepers* Aſtrologicall way of every Planets Dominion over Plants, yet I conceive that the Sunne and Moon have generall influences upon them, the one for Heat, the other for Moiſture; wherein the being of Plants conſiſts, and that the Full of the Moon would be a good time to gather thoſe Herbes, out of which the juyce is to be taken, for then it is moſt plentifull, but for other uſes, the Leaves newly gathered (if it be not when they are

but for other uſes, the Leaves newly

very young or very old) are queſtionleſſe the beſt, but at ſuch times, or when they are not at all to be had, we muſt be glad to make uſe of the dryed ones, which whether dryed in the Sun, or in the Shade, ſo they be neither over nor under dryed, it ſignifieth very little. 2. Thoſe which you gather for your uſe in Winter, gather a little before they run to Seed, for then they be moſt effectuall. 3. Let them be gathered (as neer as you can) from their proper places, which I have directed you to in the ſixt Chapter. 4. For the place you put them in, it matters not, ſo they loſe not their vertue by too much heat, nor corrupt by too much moiſture: For Flowers let them be gathered in their prime, dryed and laid up as aforeſaid. 5. For Seeds let them be gathered when they are full ripe, and kept not above 2 yeare, for afterwards they decay. 6. What roots you have growing ſo neer you, that you can goe to them upon all occaſions; trouble not your ſelfe to dry, but if you chance to

The Art of
SIMPLING.
AN
INTRODUCTION
TO THE
KNOVVLEDGE
AND
Gathering of Plants.

VVherein the Definitions, Divisions, Places, Descriptions, Differences, Names, Vertues, Times of flourishing and gathering, Uses, Temperatures, Signatures and Appropriations of Plants, are methodically laid down.

Whereunto is added,
A Discovery of the Lesser World.

By W. COLES.

LONDON,
Printed by *J. G.* for *Nath: Brook* at the Angell in Cornhill, 1656.

The Art of
SIMPLING.
AN
INTRODUCTION
TO THE
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VVherein the Definitions, Divisions, Places, Descriptions, Differences, Names, Vertues, Times of flourishing and gathering, Uses, Temperatures, Signatures and Appropriations of Plants, are methodically laid down.

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LONDON,
Printed by *J. G.* for *Nath: Brook* at the Angell in Cornhill, 1657.

The title pages of the two issues of Coles' rare work "The Art of Simpling," alike except for the dates of 1656 and 1657. At the left is the page from the earlier work, owned by Mr. Lownes, while at the right is the page from the book now owned by Mrs. Rosetta E. Clarkson, the contents of which show a reversal of view from the earlier printing.

concerning Plants." His chapter "Of the Speculative and pleasant use of a Garden" is a delightful little essay and he quite disarms us by his candid admission, "I have added some Observations of mine own, never before published: Most of which I am confident are true, and if there be any that are not so, yet they are pleasant." How can one help loving so charming a fellow?

Today the solid merit of Coles' books is almost forgotten. Anthony Wood, in his *Athenae Oxoniensis,* 1692, calls Coles "the most famous Simpler or Herbarist of his time," but the basis for this statement is not given and it is not borne out either by contemporary notice or later repute. Coles is remembered today chiefly for his scathing attacks on Culpeper and the astrologers.

Ordinarily, Coles seems to have been a gentle and unassuming man, but his attacks on Culpeper are savage, even for the outspoken age in which they were written. We shall probably never know what caused the outburst. If the two men ever met, we have no record of it. Coles gives no reasons for his choler and Culpeper could not reply. He died two years earlier.

"Master *Culpeper* (a man now dead, and therefore I shall speak of him as modestly as I can, for were he alive, I should be more plain with him) . . . ; . . . he forsooth, judgeth all men unfit to be Physitians, who are not Artists in Astrology, as if he and some other Figure-flingers his companions, had been the onely Physitians in *England,* whereas for ought I can gather, either by his Books, or learne from the report of others, he was a man very ignorant in the forme of Simples." Thus Coles in "The Art of Simpling," 1656.

Coles' whole reputation as the chief opponent of astrology rests on a few sentences of like tenor, but the words were scarcely off the press before he changed his mind—or had it changed for him. In his "Adam in Eden, published in 1657, I have noticed no disparagement of astrologers, *per se.* He mentions Culpeper frequently and not always in complimentary terms, but his pen is comparatively restrained.

In 1938 Mrs. Rosetta E. Clarkson reprinted "The Art of Simpling" for the Herb Lovers Book Club, using a copy which she owns, dated 1657. It was her belief that this was merely a re-issue of the book of 1656, but when I compared my copy of the work with the reprint, I was interested to find textual differences. Mrs. Clarkson very kindly lent her copy of the original to me so that I could study the two side by side. This proved that there were two issues of "The Art of Simpling" and that they differ in significant particulars. The copy that Mrs. Clarkson used for her reprint represents a second issue, unknown to bibliographers and apparently unique.

In this issue, five leaves (A1, B1, E2, E3, and E4) are replaced by cancels and signature *a* (four leaves) is omitted entirely. Four leaves of advertisements, present in my copy, are omitted in Mrs. Clarkson's. The catchword on the verso of F6 has been corrected from "hr" to "her", but minor errors of this kind were often corrected on the press and do not necessarily have bibliographical significance.

Leaf A1, the titlepage, is unchanged except for the date. It seems to

be from the same setting of type as the first issue, which would suggest no lapse of time between the two. Even the egregious error, "Definitions", is carried over.

Each of the other cancelled leaves, however, carries an attack on Culpeper and his astrological beliefs. In the second issue, these are rewritten so as to reflect no discredit on the astrologers. Indeed, Coles backs up so far from his castigation of the astrologers on the verso of B1, that he appears to embrace their views! Knowing only this second version, Mrs. Clarkson wondered how Coles received his reputation as a baiter of astrologers.[3]

The omitted signature *a* provides a clue. This signature contains the dedication and a leaf of errata. When Coles wrote his book, he had no dedicatee in mind. In his preface, he "hopes that this Embryo . . . will fall into the Lap of some worthy persons that will cherish it, though I knew not any to whose protection I might commend it." Then he must have learned that Elias Ashmole had taken up the study of plants. Ashmole (1617-1693) was no man to do things by halves. Typical was his manner of taking up the study of plants. In his diary he wrote, "1648. June 6. Having entred upon the study of plants, this day about three a'clock, was the first time I went a simpling." If Coles could put his book under his protection, it would stand a great chance of success. In the seventeenth century, dedicating a book was the equivalent of getting a grant-in-aid, say, from the Council of Learned Societies. The dedicatee was expected to "patronize" the book in a very tangible way.

Unfortunately, Coles did not know his man. Ashmole, to be sure, had decided to become a "simpler", but he was also a leading astrologer and an ardent Royalist, and Coles had gone out of his way to stress the fact that he was "a good Common-wealths-man" and to express his distaste for astrologers.

Unless there is some information among Ashmole's unpublished papers, we shall probably never know exactly what happened next, but we can imagine that Ashmole read Coles' unfortunate dedicatory epistle with rising anger and that he withdrew his patronage. Ashmole's "diary" throws no light on the matter, but Ashmole was not a diarist in the strict sense. His diary is not a day-by-day account, but a rambling record of trifling affairs. Often he does not touch it for months and he confides no secrets to it. At any rate, the signature containing the offending dedication was removed from the book.

[3] Journal of N. Y. Botanical Garden, Jan. 1939, p. 24.

On the opposite page:

Part of the dedication of the original version of "The Art of Simpling," in which Coles apparently made the mistake of embracing a philosophy opposed to that of the man who, he hoped, would become his benefactor.

CHAP. XXXII.
Of the Speculative and pleasant use of a Garden. 114

CHAP. XXXIII.
Of the Practicall and profitable use of a Garden. 119

To the most Exquisite Lover of Plants, ELIAS ASHMOLE *Esq.*

Honoured Sir,

THough I am a stranger to your Person, yet should I be so to your vertues, I might very well seeme to be an Inhabiant of another Country, and not of this, wherein your Fame is so eminent for countenancing all those that bend their endeavours to advance any kinde of learning. And though I did despaire the

An

a para-

patronage of any worthy perso to my well-meaning endeavours, yet since being animated by the generall repute of your excellency in this kind, and the heigh of perfection which you have attained in this pleasant Study, I doe here present you with wha I have expressed in the Epistle t the Reader. The Result of many years experience, which I hav imployed for the benefit of my Countrymen, whose ignorance i the forms of simples is very much to be pitied. In commiseratio whereof, I have made it my car to muster up a number of such Observations, as may tend much to their benefit, if so be they ca lay aside their self-conceitednes and diligently follow what is her prescribed. I goe not about t deceive them with a few empty

deceive them with a few empty

Notions; as Mr. *Culpeper* hath lately done, telling them many Nonsensicall stories of I know not what; when as it is evident to those that knew him, or are able to judge of his Writings, that he understood not those Plants he trod upon. And that which addes to his fallacious assertions, is, that he hath obtruded these things upon the Country people, perswading them that they would be much for their benefit; who being taken with any novelty, swallowed his bait, hoping that there might be somewhat of value in them, but were too too much deceived, as experience may plainly shew. All the Rocks at which he willingly stumbled, I shall carefully avoid, and plainly demonstrate to their senses the reasonablenesse, plea-

a a sure

Someone decided, too, that it was safer to rewrite the passages about astrology. Perhaps it was the printer or the publisher. It may have been Coles. Possibly Ashmole demanded the change. By 1657 the Commonwealth was on the down-grade and Ashmole had a good deal of influence with the rising Royalists. In any case, to save the investment and to make the book marketable, five new leaves were printed. These were inserted in place of the leaves that seemed likely to make trouble and, in its new and innocuous form, "The Art of Simpling" was placed on the book-stalls once more.

Or was it? I sometimes wonder. If the book was sold, why is it so rare? Coles' book has great merit, yet it was never reprinted and very few copies have survived, while Culpeper's works went into dozens of editions and hundreds of copies exist. Ashmole was a powerful man and a vindictive one. I cannot escape the feeling that he may have been dissatisfied with the revised volume and that he may have succeeded in suppressing the book. This was not done openly, perhaps, but Ashmole was a master of underground politics.

Years later, Anthony Wood tried to get the facts from Ashmole for his *Athenae Oxoniensis*. Ashmole's reply is a model of evasion:

"3 July 1682. I am sorry I cannot at present give you any account of Mr. William Cole. But as he, so some others (that have dedicated Bookes to me) were indeed strangers to me, and I have never heard of them after. Beside the stationer is dead, and there I am at a loss also. But I will not rest here, but beare it in mind."

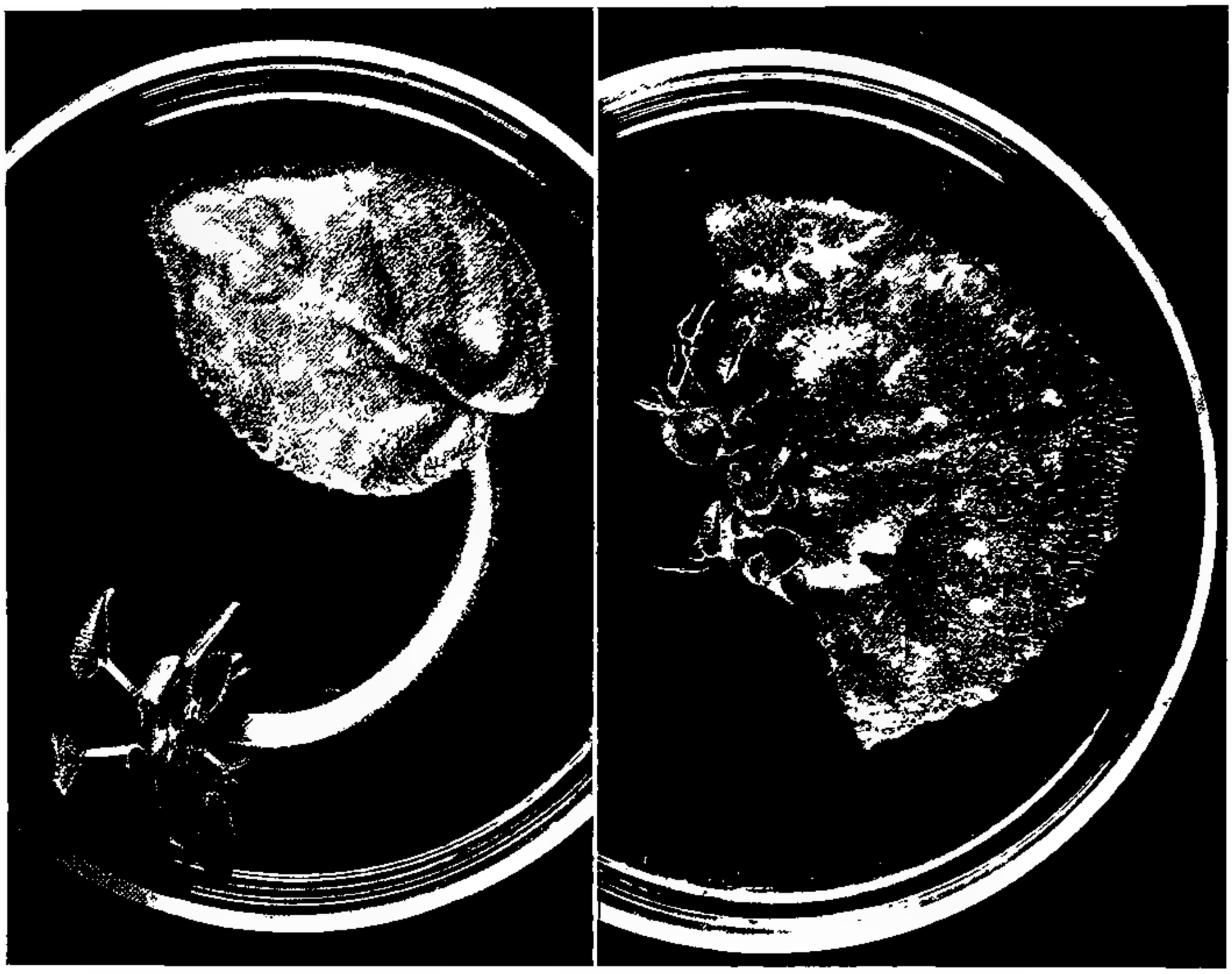
Perhaps he did!

African Violets For The Window Garden

A Note on Their Culture and Propagation
By E. E. Naylor

AFRICAN violets are not difficult to grow. By following a few simple directions it is possible not only to grow beautiful plants, but also to start new plants by the fascinating method of propagating from leaf cuttings. And for any collection of house plants this native of South Africa with its deep purple flowers and orange stamens and velvety leaves will be most welcome.

Cultivation of the African violet, or *Saintpaulia* as it is known scientifically, requires very little sunlight, not too much heat, and a considerable amount of moisture. Most of our modern steam-heated apartments are much too hot and dry to encourage luxuriant growth of this plant, but with very little trouble these conditions can be altered somewhat. An



African violets being propagated from leaf cuttings. At the left, young plants growing from the base of a petiole 10 weeks after the cutting was taken. Right, 15 weeks after a cutting was made from the tip of a leaf. New plants arise from the region of the midrib, but their appearance is slower.

east window, with exposure to an hour or so of morning sunshine, will furnish all the light that is necessary. Even a north window with no direct sunlight will prove satisfactory. If these situations become too cold at night the plants should either be removed to a warmer place or protected with newspaper. By placing pots of plants in a shallow tray containing wet gravel or sand, the moisture content of the air will be increased in the immediate vicinity, or the humidity of the entire room may be increased by constant evaporation from pans of water set on the radiators.

The root system of the African violet is rather fragile and not very extensive, so that small pots are ordinarily used. A light soil composed of garden loam, a little sand, a considerable amount of leafmold, and a bit of charcoal is recommended. Ample drainage must be supplied so that excess amounts of water will readily drain away. The leaves of the African violet very readily develop spots and finally rot when water is allowed to stand on their hairy surface for any length of time. For this reason it is advisable to supply the water carefully to the soil surface, or to stand the pots in a shallow basin of water and allow it to rise up through the soil.

The easiest and quickest method of propagation is by division of the old plants. This is easily accomplished by taking the plant out of its pot and cutting the crown into several parts, leaving fairly equal portions of root and top growth on each part. These may be set immediately into two-inch pots, watered well and kept in a cool shady place for several days. Divisions may be made whenever the plants appear to be much crowded.

A slower but much more interesting way to propagate the African violet is by leaf cuttings. Several of the outermost healthy leaves may be removed with a clean sharp knife, making the cut close to the base of the plant so that a considerable portion of the leaf petiole is attached to the leaf blade. A small pot, or any box or can, with allowance for drainage, can be used as a container for the sand which makes one of the most satisfactory rooting materials. The entire leaf petiole should be inserted in the sand, which has previously been well soaked with water and made compact, and the leaf blade allowed to stand upright in the air. If the leaves tend to wilt, a glass tumbler or jar may be inverted over the cuttings—otherwise conditions should be similar to those required for mature plants. After six or eight weeks several new plants will appear at the base of the petiole, and it will probably require two more weeks for these plants to make their appearance above the surface. The first illustration shows the development of plants from the petiole after 10 weeks when the leaf was kept on moist blotting paper in a covered glass dish. As soon as the young plants are an inch or more high they may be removed from the parent leaf and grown the same as seedlings.

A similar type of propagation can be accomplished by using the leaf blade without the petiole. When this is done the lower portion of the blade is inserted in the sand to a depth of about an inch. The new plants may appear on both sides of the leaf but will always be found near the larger veins. The time required for the formation of new plants from the leaf blade will probably be longer than that required when the petiole is included in the cutting. The second illustration shows how the new plants appear on a leaf-blade cutting which has been in a moist dish for 15 weeks.

This method of growing additional plants from leaf cuttings is the one employed by florists although seeds may also be used. *Gloxinia, Achimenes, Streptocarpus,* and a few other members of the Gesneria family, can be propagated by this same method. Cuttings may be made at any time of the year and no special equipment is necessary. The amateur need not hesitate to attempt to grow African violets and enjoy the pleasure of experimenting with this rather unusual type of propagation in his own window garden.

Certificates Given To Students In Two-Year Practical Gardening Course

THE first class to complete the New York Botanical Garden's Two-Year Course in Practical Gardening was granted certificates at graduation exercises which took place the evening of June 27 in the Museum Building. Max Schling, New York florist, and a man who for 52 years has been associated with horticulture, was the principal speaker. The program was opened with a description by Dr. William J. Robbins of the training in gardening offered at the Botanical Garden.

Mr. Schling spoke of the spirit and meaning of gardening and of its influence on the lives of those who engage in it. He used his own experience in a long life of gardening (he said he had been associated with horticulture for 52 years) to describe the opportunities and lessons that arise through working with plants and Mother Earth. He spoke with feeling of the influence of older people in his younger days whenever he communicated to them his eagerness, his ambitions, his ideas. And he expressed appreciation for the organized training that today is made available to gardeners, in contrast with the method of "learning by stealing the other fellow's arts" which was prevalent in his day.

(Mr. Schling himself studied with the great Duval at Versailles, after having studied to become a sculptor in Vienna.)

Influence of Gardening

"Gardening," he said to members of the class, "will engender in you love of a particular patch of ground, and through that it will bring you sentiment, and love of your fellow-men. It will bring you something you can not get in any other way, and will make a better citizen of you.

"In learning the fine feeling of helping to make the earth more beautiful you will turn automatically to what is fine in human beings. . . . Knowledge of flowers makes men of all nations understand each other.

"Our profession is something sacred."

Gardeners who enter other walks of life do so only temporarily, he said. They always return, for "they want to feel the rain in their faces, the warmth of the sun on their backs, and feel the wind blowing about them in the field. *They want to grow flowers.*"

In closing he addressed the members of the class directly, saying, "Feel with your heart, see with your eyes, and dig down deep into the secret of Mother Nature. I wish you may all travel through life loving your profession and living and understanding your fellow-men. The feeling of the earth will help you."

Dr. Robbins' Address

In his introductory address Dr. Robbins described the two courses for gardeners that are offered at the Botanical Garden.

"The first of these, the Two-year Science Course for Professional Gardeners, has been in existence eight years," he began. "It was initiated in the fall of 1932. It was designed to bridge the gap which exists between that body of knowledge of theoretical horticulture possessed by the scientist and that body of knowledge in the practice of horticulture which is the property of the professional gardener. A botanical garden with its wide variety of plants and cultural practices and its trained staff of technical men is uniquely suited for training of this kind. This is amply borne out by experience abroad. There the value of a few years spent in a botanical garden as part of a gardener's training has long been recognized, and men who have graduated from these institutions fill major horticultural positions throughout the world and have had a tremendous influence upon

the development of horticulture. The New York Botanical Garden's scheme of training of professional gardeners is modeled after that of the Royal Botanic Gardens, Kew, England, with modifications to meet American conditions. The general plan is as follows, and you will note that it combines the practical and the theoretical:

"Young American gardeners are offered the opportunity of working at the Garden for a period of from two to four years. During this time they receive compensation sufficient to meet ordinary living costs. They are required to work forty-eight hours per week and to perform all the tasks incident to the position of gardener. Evening courses of instruction in systematic botany, in plant morphology, physiology; breeding and pathology as well as training in entomology, soils, and fertilizers given by members of the Garden's technical staff, cover a two-year period and are obligatory. On the successful completion of this two-year course a certificate is awarded."

Dr. Robbins described the arrangements made for exchange of student gardeners between the New York Botanical Garden and other institutions, and then proceeded to outline the aims and purposes of the new Course in Practical Gardening, for which 18 certificates were being awarded that evening.

"This represents the first attempt, so far as I am aware," he remarked, "to make available the information accumulated by the best experienced professional gardeners for the benefit of individuals seriously interested in learning the art of gardening. It includes both classroom work and practice and it is our hope that it will serve the amateur as the Science Course has served the professional gardener, namely, to increase the interest in gardening and disseminate the best that is known in garden practice."

The Graduates

About 200 attended the exercises, which took place in the lecture hall. Refreshments were afterward served in the main rotunda.

Those who received certificates for completing the two years of study were: William B. Ash, Eugene F. Brady, Roger Hennessey, and William Ohnemus of Northport, Long Island; Joseph A. Dietrich of St. James; Mrs. Marion C. Ernst of Woodside; Miss Elsa C. Steinberger of Jamaica; Meyer Kaplan and Duncan McMaster of Smithtown Branch; Herman Salsky and Frank McCormick of Brooklyn; Lillian Meyferth of White Plains; Gove B. Harrington of Katonah, N. Y.; Eric Lawaetz of Ridgefield, Conn.; Michael Batterson of Newark; and Dorothea Mierisch, Bertha Green, and Carol H. Woodward of New York City.

Instructors in the Course

The work, which has all been under the direction of T. H. Everett, has consisted of 12 sessions each in the subjects of Cultivation of Trees and Shrubs (James G. Esson, instructor); Cultivation of Greenhouse Plants (Joseph W. Tansey); Fundamentals of Gardening (T. H. Everett); and Outdoor Flower Gardening (P. J. McKenna); with eight sessions each in Indoor and Outdoor Gardening Practice, the former term under the instruction of Mr. Tansey, the latter with John Watts, Head Gardener on the H. E. Manville estate; Robert Scott, Superintendent of the estate of Mrs. A. W. M. Burden; and George Gillies, Head Gardener of the Marshall Field estate, as instructors.

A new term of study will start next fall, and those who enter then will be eligible for certificates, upon completion of the work, in June 1942. Meanwhile, those who commenced the course last September and have taken the work for credit may graduate next June.

One other certificate was granted at the exercises last month. It was presented to Herbert Johnson of Bayside, L. I., for completing the Two-Year Science Course for Professional Gardeners.

*

Membership Pamphlet Issued

A limited edition of a 12-page illustrated leaflet describing the purposes of a botanical garden and of the New York Botanical Garden in particular came off the press the first of this month and is now being distributed to a selected list of persons. A copy will be sent to any Journal subscriber requesting one, or to any person whose name may be suggested by a subscriber.

The pamphlet briefly outlines the activities of the Garden, tells about the services that are free to the public and the courses offered for a small fee, and lists the privileges and advantages of membership in the New York Botanical Garden.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Gardening for Everybody

HOUSE & GARDEN'S BOOK OF GARDENING. (Richardson Wright, Editor). 125 pages, illustrated and indexed. Condé Nast Publications, Inc. New York and Greenwich, 1940. $2.

House and Garden's Book of Gardening concerns itself with the production and use of the ornamentals with added up-to-date notes on the home growing of fruits and vegetables. This book, it would appear, is intended for the amateur and professional gardener. It will be of interest to each and of special value as a reference book for garden clubs and the home owner. It succeeds as well as any popular volume may in attempting to reach all gardening groups. In 125 10x12-inch pages, the editor offers concise and well illustrated information on 124 garden subjects, from lilies for the beginner to Italian gardens. A competent selection is made of plants for special conditions and purposes, which should be useful to the amateur. Height, color and season of the flowers are included as well as the height of selected evergreens, but the editor fails to note that the latter figures can be at best only approximate for various localities.

The illustrations in the book are numerous and very well selected. There are gardens and plants in color, many photographs, and pen and ink sketches to illustrate each subject. Many garden scenes are from well known estates; some appear to have been taken at flower shows. One marvels at the number of pen and ink sketches to show the growth habits of woody plants, but they have no value for varietal identification.

The listing of tools is by no means complete. The professional gardener would be lost without many of his old favorites such as the narrow steel rake, which are omitted. Rose culture is well presented. However, the continuous use of that bale of peatmoss for a summer mulch is one of the best methods yet discovered to gradually spoil a rose garden on the heavier types of soil. It is no easy task for the amateur to use a color scheme in the perennial border. The brief attention given this subject states some of the principles, but does not simplify the problem. Gardening in frames is an increasingly important topic for the amateur and is given due attention in the text. There is also useful information on rock gardening. This subject is so broad that the brief notes are really too vague to be of any special value to anyone unacquainted with the subject. A person with some knowledge of the subject will find no new thoughts. For a courageous attempt to combine a gardening and landscape text in one short volume, Richardson Wright, as editor, has done a good job.

LOUIS VAN DE BOE.

Far-Reaching Outlook In Soilless Culture

Remarks on Three New Books

THE COMPLETE GUIDE TO SOILLESS GARDENING. William F. Gericke. 285 pages, illustrated with photographs, indexed. Prentice-Hall, New York, 1940. $2.75.

Views of a Pioneer

This exposition of soilless gardening is of particular interest because the author was largely responsible for first bringing the possibilities of the method to the attention of the general public. This book is entirely devoted to the subject in contrast to many other books with the same general title, which devote much space to other topics. The book includes an introduction, a description of the apparatus required, nutrient solutions used, the proper water to use, a discussion of methods of planting, effect of physical conditions, symptoms of deficiencies and discussions of the growing in tank culture of tomatoes, potatoes, root vegetables, annual flowers, bulbs, corms, tubers, rhizomes and various specific plants. It is primarily concerned with water but there is some discussion on sand culture.

As might be anticipated the author is an advocate of soilless culture and a strong believer in its practical applications. He says, "Nations such as Italy and Japan . could easily use it to multiply their production of food stuffs manifold. Once their hunger is satisfied within their own boundaries, the reasons for seizing the rolling wheat fields of their neighbors might be swept away." Whether experience will bear out such an intriguing and far-reaching suggestion remains to be seen. In any event a book by the man chiefly responsible for the popular interest in soilless gardening is well worth reading.

WILLIAM J. ROBBINS.

Results in Europe

GARDENING WITHOUT SOIL. A. H. Phillips. 137 pages, illustrated. Chemical Publishing Co., New York, 1940. $2.

This is the first of the books on this subject to come to the reviewer's attention, which describes results obtained in Europe. The chapter headings are: How Plants Grow, Water Culture, Aggregate Culture, The Nutrient Solutions, Soilless Culture in Practice, and Soilless Culture on the Farm. Although the author recognizes some of the misapprehensions and exaggerations which have resulted from irresponsible publicity on soilless gardening, he inclines toward over-optimism rather than ultra-conservatism.

WILLIAM J. ROBBINS.

Ohio Experiments

SOILLESS CULTURE SIMPLIFIED. Alex Laurie. 201 pages, illustrated and indexed. McGraw-Hill Co., New York, 1940. $2.50.

This is one of the better books on the subject which has so caught the public fancy. The text is based in part upon the author's own extensive experiments at the University of Ohio. The first five chapters, occupying more than half the book, are concerned with basic material on the history of the solution-culture method, the soil and the functions of nutrient elements, nutrient deficiency symptoms for specific horticultural plants, fertilization of plants in soil, and how plants grow. The last four chapters are devoted to commercial growing of crops in sand, in water, and in gravel with specific instructions for the amateur.

WILLIAM J. ROBBINS.

West Coast Garden Guide

GARDENING FOR FUN IN CALIFORNIA. Jean-Marie Consigny with Charles Palmer. 249 pages, figures, plans, diagrams, charts. George Palmer Putnam, Inc., Hollywood, 1940. $2.50.

In the still rather slender literature for the California amateur gardener this book will be welcomed, by the beginner especially, for its combination of sound orientation in the conditions of gardening and its wholly desirable approach to gardening as pleasure. It seems a particularly personal publication and the author's cheerful and sprightly attitude will endear it to the many who, like her, garden for fun, not only in California but all over America. The subjects selected for inclusion are those of interest to the majority of young home gardeners, the planning of the small place, the care and feeding of plants, lawns and the problems of certain types of gardening common on the Pacific Coast, those having to do with beach and hillside gardens and with patios. The tables, charts and calendar are again evidently compiled for the beginner. Plant materials take a quiet secondary place and the more experienced amateur should not expect to find here much about them that he doesn't already know.

SYDNEY B. MITCHELL, *President, California Horticultural Society.*

Biological Point of View

BASIC COURSE IN BOTANY. Raymond J. Pool. 654 pages. Illustrated and indexed. Ginn & Co., Boston, 1940. $3.75.

The aim of this book is to "emphasize the essentials of science, and especially the broad, biological point of view, more consciously than is done in similar works. The phenomena associated with plants are presented as features of the dynamic cosmos as a whole."

After reading this one is somewhat disappointed to find a treatment similar in plan and substance to many existing works. It is true that the first chapter, entitled "The Point of View," touches rather naively on various difficult aspects of epistemology and the psychology of learning. This is followed by a chapter which presents in ten pages "the basic facts of protoplasm, matter, and energy." The following chapters contain a quite

conventional and competent account of plant anatomy and morphology. In contrast to the ten pages given to the structure of woody stems, photosynthesis gets only four, and its relation with animal life one short paragraph. The other foods have two pages, respiration three, and growth half a page. Inorganic nutrition is scarcely noticed; vitamins and hormones are briefly mentioned in one sentence.

A third of the book is devoted to a copiously illustrated account of the plant world. The economic uses of many plants, such as yeast, are well handled; but it is somewhat surprising to find the human values of the Gymnosperms dismissed in seven words. The distinctive contribution which may make this book valuable to some teachers is the emphasis upon plant sociology and ecology. Environmental relationships are discussed throughout the work and in two special chapters (60 pages). The last chapter treats of variation, heredity, and evolution, all in 24 pages; aspects of biology which are evidently, like growth and respiration, not features of the dynamic cosmos.

The book is attractively bound and printed. Many of the 541 figures are well executed and should interest the student as well as aid his understanding. A pleasing feature is the use of several drawings from the classic works of Grew, Hooke, and others. The half-tones, because of the thin paper used, leave something to be desired. The legend of figure 348 reads: "Turf formed by a club moss, *Selaginalla densa*. One would scarcely recognize this as a dense covering of ferns." One would not.

But if we search vainly for novelty in the treatment of the subject, we find it in certain illustrations. The frontispiece purports to be a plant considered as a factory, in a manner reminiscent of the palmiest days of Heath Robinson. A benignant sun, properly hooked up with electric cables, smiles over all—smiles literally with real lips and eyes. The same deity appears in a diagram of photosynthesis; his smile here is actually coy. Has the classroom finally been invaded by the comic strip? One can see great possibilities in the graphic representation of, say, the life cycles of plants by the technique used for the adventures of Popeye the Sailor.

H. W. RICKETT.

A Children's Introduction to Conservation

WORKING WITH NATURE. Eleanor King and Wellmer Pessels. 181 pages, illustrations. Harper & Bros., New York, 1939. $1.20.

Although written for children, the absorbing discussions of the habits and ecological relationships of the common insects and other animals will claim the interest of many adults who browse through the pages of this book. A large portion of the book is devoted to the insects, and the balance covers some of the phases of wildlife conservation, including information on fishes, hawks and owls, ducks, furbearers, beavers, and a brief chapter on the big game animals. The newer, ecological point of view of conservation is given in a form which teachers of nature study can use to advantage as a source of information for themselves as well as for their pupils.

Suggestions for further sources of information, a few research problems for the class, and a bibliography are included in an appended chapter. The 60 offset illustrations are inserted in three groups of pictures with the captions separated from the pictures and given on one page at the beginning of each group.

J. W. THOMSON, JR.,
The School Nature League.

Trees of the Rockies

ROCKY MOUNTAIN TREES. Richard J. Preston, Jr. lxxxi+285 pages. Illustrations, glossary, bibliography, index. Iowa State College Press, Ames, 1940. $2.

In contrast with the situation a few years ago, there are now many books on trees on the market. However, this volume is the first to cover the area from Montana and Idaho south to the Mexican boundary.

This attractively bound book deserves, in general, little but praise. The morphology in the introduction is not strictly accurate and the explanation of the "parenthetic author" is far from complete but, it must be admitted, these inaccuracies will not detract from the utility of the book. The rest of the written portions are too technical to catch the fancy of the public, but the drawings and maps

may well offset this. Foresters, students, and the many people who would like to know the trees of the Rockies will welcome the book and find it usable.

Of the 252 species treated, more than half are illustrated on full page plates. The accompanying distribution maps are handy, and probably as accurate as exist. Corkbark fir occurs in the Tunitcha Mountains on the New Mexico-Arizona boundary, farther north than is shown, and a triangular-leaved cottonwood (*Populus Sargentii?*), which occurs south of the Uintah Mountains in northern Utah, does not fit into the map of any of the three possible species that it could be. It is difficult to attain exactness on the smaller scale maps, but many examples of minor inaccuracies show up, such as the apparent absence of alpine fir and Douglas fir from northeastern Arizona, and one-seed juniper and western yellow pine from the Oklahoma panhandle.

In thumbing through the book errors seem few—an extra "s" in *Douglasii*, and extra "i" in *Thornberi*, and only occasional typographical errors were noted.

The author is to be commended for so capably filling in another gap.

GEORGE J. GOODMAN,
Iowa State College.

Tibetan River

SALWEEN. Ronald Kaulback. 331 pages, illustrated with photographs and a map, indexed. Harcourt, Brace & Co., New York, 1939. $3.75.

The Salween, one of the greatest rivers in the world, offers a perpetual challenge to the explorer. So far no one has yet found its source, though at least one expedition has set out with this purpose in mind.

This is the expedition of Ronald Kaulback, who in 1933 accompanied Capt. F. Kingdon Ward on his plant-hunting trip into the far interior of Tibet. Captain Ward got as far as the Salween-Irrawaddy divide; his main geographical interest on that trip was the source of the Irrawaddy.

Kaulback determined to return, and in the spring of 1935 began a new expedition in company with John Hanbury-Tracy. After eighteen months in Tibet the pair returned to civilization, the source of the great Black River, the Salween, still having defied them, but they having successfully covered and mapped a vast amount of previously unexplored territory. Kaulback received the Murchison Grant of the Royal Geographic Society.

The book gives an almost daily account of adventures on the trek from Burma into the mountains of Tibet over little traveled roads and almost impassable trails, and each chapter is pleasingly headed with a sketch in oriental style, some native script, and a suitable quotation in plain English. The photographs show views of overpowering mountain ranges and reveal the nature of the natives with whom the explorers had to deal and live during much of their journeying. A brief list of plant collections is included in the appendix.

CAROL H. WOODWARD.

A Plant Hunter's Favorites

PLANTS WITH PERSONALITY. Patrick M. Synge. Illustrated with plates from Dr. Thornton's "Temple of Flora" and with drawings by John Nash. Indexed. E. P. Dutton & Co., New York, 1940. $3.

This interesting book has been ably written by a British plant hunter. He writes with distinction and humor of plants which have fascinated him. The plants are mostly exotics and rarities, though many of them are of easy culture in our own gardens. There are African giants and fierce wonders from South America, strange cacti, insectivorous plants and others of great beauty from far away places. Some of the most vigorous bits of writing occur in a chapter called "Fly pollinated plants." He discusses furthermore both usual and uncommon forms of plants familiar to many of us and of easy culture. To Mr. Synge, a good plant is not merely a plant easy to grow. "That," as he says, "would imply a refusal of the challenge entirely unworthy of English gardeners, and indeed contrary to their practice." The work is enhanced by very fine illustrations.

HARRIET K. MORSE.

A Textbook in Landscaping Useful to Home Owners

PLANTING DESIGN. Florence Bell Robinson. 215 pages, halftone and line illustrations, references, problems, index. Whittlesey House, New York. $2.75.

This is a concise, yet comprehensive, introduction to the selection and use (arrangement) of plant materials in the creation of landscape effects in relation to principles of design and basic ideas of good composition. Its point of view seems to be pretty well expressed in these two quotations: "*What* plants are used matters not at all, provided that the choice meets the necessities of good design. *How* they are used matters very greatly. Composition and not rarity of materials is the important thing." And, "Modern thought and taste demand that plants shall be suited in form and size and growth to the use or purpose required, that they shall be adapted to the conditions under which they must grow, that they shall be able to maintain themselves happily under these conditions, and that their use shall be a matter of design, not merely of chance or propinquity, of design planned with reference to their location, their use, their surroundings, harmonious with the latter in line and form, in texture, and in color."

As a text for students of landscape architecture (for whom it was originally written), the book should be appraised by one of them, or by a member of that profession. This reviewer considers it rather in the light of its appeal and potential usefulness to the average home owner or garden enthusiast concerned with the development of the possibilities of one particular property or, at most, a very few. Because such a reader might easily be overawed or discouraged by the theoretical material first encountered in its logical approach, we have an idea that he, or she, will get the most out of it by reading it—at least the first time—in reverse order. That is, let him start with Part Three, which deals with actual home planting demonstrations and problems; then Part Two, an admirable discussion of the effects of environmental factors, both natural and man-made, upon plant growth and the selection of plant materials for different purposes; and finally, the opening five chapters which deal with such basic considerations as the theory and use of color and of texture, the attributes of mass, grouping and arrangement, etc. Having reached the end of Part One by this somewhat devious route, the reader will be well qualified and equipped to read the rest of the book over again with increased interest, understanding, and benefit; and also to continue with a study of the references to many other works grouped at the end of each chapter.

That a book of this sort is offered to the general reading public is, we feel, a good sign—a tribute to the desire of home owners for more attractive home surroundings, and a recognition of the necessity and desirability of making landscape architecture and its underlying principles more generally understood, appreciated, and used in connection with homes and home communities.

E. L. D. SEYMOUR,
Horticultural Editor,
The American Home.

Notes, News, and Comment

Lectures. At the semi-annual dinner of the Phi Sigma Society at Hunter College, New York, June 7, Dr. W. J. Robbins spoke on "Light and the Growth of Plants." T. H. Everett spoke on "The Thompson Memorial Rock Garden" before the New Rochelle Garden Club, June 10. "Marvels in Adaptation Among our Local Plants" was the subject of Dr. H. N. Moldenke at the annual meeting of the Westfield Bird Club, June 3. Elizabeth C. Hall spoke on "The Literature of Gardening" before the new Canaan Garden Club June 12. Thomas Laskaris addressed the American Delphinium Society, which held its annual meeting in Boston, July 2, giving a report on the work he is doing on the society's scholarship for the study of delphinium root-rot.

Garden Clubs. Groups which have visited the New York Botanical Garden during the past month include the Mamaroneck Garden Club, the Laurelton Garden Club, which was briefly addressed by Dr. Dodge on "Garden Pests", and the Staten Island Garden Club, which came under the leadership of Mrs. Jerome W. Coombs and heard a talk in the library by Elizabeth C. Hall. In addition, fifteen members of the Suffolk County Gardeners' Association visited Range 1, the Rock Garden, Rose Garden, and the closing session of one of the Practical Gardening classes June 18.

Groups. As soon as the first of the spring flowers came into bloom in the Thompson Memorial Rock Garden and elsewhere on the grounds, numerous schools, clubs, and other groups began making special trips to the Botanical Garden, visiting outdoor and indoor displays, the Hemlock Forest, and the Museum Building. Among the classes which have come since the last of April are the Prospect Hill School, Pelham Manor, N. Y.; Public School 37, Bronx; P.S. 168, Manhattan; Washington School, New Brunswick, N. J., and biology students from James Monroe high school, New York. Dr. G. H. Shull's botany class from Princeton visited the Garden May 12; Dr. J. Harold Clark's senior students in plant breeding at the New Jersey State College of Agriculture, May 13; and Dr. Wyman R. Green's students from Drew University, Madison, N. J., May 14. Five young women studying scientific illustration at Hunter College under Mrs. P. J. McKenna inspected botanical drawings, daylily paintings, and mounted algae at the Garden May 25. A second group came a few days later. Three hundred students and teachers comprised these groups which were conducted around the Garden by members of the staff. One hundred more persons were numbered in the garden clubs and other organizations which made special trips to the Botanical Garden during the month. Twenty women from White Plains came as guests of Mrs. Henry de la Montagne May 29. The Garden Club of Lawrence, L. I., visited the displays May 13, and the following week the members of the New Canaan (Conn.) Garden Club were the guests of Mrs. Jerome W. Coombs at the Garden. The Special Libraries Association of New York spent the evening at the Garden May 15, and the Appalachian Mountain Club was here on May 18.

Visitors in May. Among those registered in the library since late April are Ryna Farber of the Agricultural School, Jorgils, Nahalal, Palestine; Kazemierz Strzmienski, Poughkeepsie; Henry F. A. Meier, State College of Forestry at Syracuse; Bernice G. Schubert, Gray Herbarium; Wyman R. Green, Drew University; J. Harold Clark, New Brunswick, N. J.; George H. Shull, Princeton University; H. St. John, New Haven, Conn., and Roland M. Harper, University of Alabama.

Summer Studies. Scholarships were granted at the New York Botanical Garden this summer to Robert E. Lee, who is studying with Dr. Stout in genetics; Dr. Arthur Hillegas with Dr. Dodge in pathology; Miss Selma Kojan, working with Dr. Stout in studies of Hemerocallis; Dr. George J. Goodman of the University of Iowa, who is working on the genus *Eriogonum;* and James Merry of the University of Michigan, with Dr. Robbins in plant physiology. Mr. Merry will go to Dennison University in Ohio upon the conclusion of his work at the New York Botanical Garden.

Dr. Margaret Fulford of the University of Cincinnati has returned to the Garden for another summer of study on the liverworts, chiefly the genus *Bazzania.*

June Visitors. The following botanists were among those who registered in the library at the New York Botanical Garden during June: Frank E. Egler, N. Y. State College of Forestry; Theodor Just, Notre Dame, Ind.; C. H. Edmondson, Honolulu, Hawaii; H. St. John, New Haven; George Thomas Johnson, St. Louis, Mo.; John T. Middleton, University of California; Samuel J. Record, Yale School of Forestry; L. B. Smith, Gray Herbarium; Maxine Larisey, St. Louis, Mo.; R. Kent Beattie, Bureau of Plant Industry; and D. R. Hoagland, Berkeley, Calif.

Radio. The New York Botanical Garden was represented by Dr. W. J. Robbins on a radio program over station WNYC, June 22, with an interview by Amie Brunn on the "Know Your New York" program, which is sponsored by the transportation systems of the City of New York. Dr. W. H. Camp represented the Garden on the Martha Dean hour, June 27.

Antilles. The library has recently received from Professor Henri Stehlé extra reference copies of Volume 1 -"Les Orchidales" of his "Flore Descriptive des Antilles Françaises;" also Volume 2 of his "Flore de la Guadeloupe et Dépendances — Catalogue Des Phanerogames et Fougères;" the latter by H. and M. Stehlé and L. Quentin. The orchid book is illustrated by drawings, the other with photographs, and both contain maps of the region.

THE NEW YORK BOTANICAL GARDEN

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E. J. ALEXANDER.....*Assistant Curator and Curator of the Local Herbarium*
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JOSEPH F. BURKE.....*Honorary Curator of the Diatomaceae*
ETHEL ANSON S. PECKHAM..*Honorary Curator, Iris and Narcissus Collections*
ARTHUR J. CORBETT .....*Superintendent of Buildings and Grounds*
A. C. PFANDER .....*Assistant Superintendent*

To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by complete descriptions and other pertinent information.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

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CAROL H. WOODWARD, Editor
August, 1940

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For New Yorkers who have been spending the summer in the city, the New York Botanical Garden has been providing a refuge from the heat, the noise, the dust, and the crowding of people, and has been offering in their stead the peaceful atmosphere of its broad expanses of lawn, flower gardens, trees, cool breezes, and woodland walks that make the city seem miles away.

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Those who are closely associated with the institution believe that a membership brings as many benefits to the contributor as to the institution itself.

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Sugar—

A Comment on the Sweetest Age in History
Adapted From a Lecture Before the Barnard Botanical Club

By William J. Robbins

THE consumption of sugar per person in the United States amounts to between 100 and 120 pounds per annum. In fact, nearly 1/5 of our food requirements, measured in energy units, comes from sugar, and the sugar consumption per person in the United States during the past 100 years shows the increase in the importance of this substance in our diet. In 1830 we used 10 pounds per year; in 1850, 20; in 1870, 43; 1890, 73; 1910, 80, and now over 100.*

In biblical times honey was the sweetening, and the prosperous land was a land flowing with milk and honey. Sugar was almost unknown to the western world in the early years of the Christian era and when first introduced was costly and was considered to be a medicine. Pliny the Elder in the first century called it a kind of honey collected from bamboos. In the middle ages it was a luxury seldom indulged in even by the wealthiest classes, and pure sugar was a gift for kings. An inventory of the cuisine of the widow of Charles le Bel, who reigned in France between 1322 and 1328, included 22½ pounds of ginger, 3 balls of almonds, 6 pounds of pepper and 20 pounds of sugar in 4 loaves. Sugar in those days was sold by the apothecaries along with cloves, fennel, anise, ginger, hellebore, gum tragacanth, and other drugs or spices.

It is not possible to say exactly when sugar came to be regarded as a food rather than as a flavoring or a drug. Certainly, general use of sugar in the western world is a product of the 19th century. George Washing-

*Part of the basic material in this article was obtained for the author by Miss Edna Kobs during a summer scholarship at the Garden.

ton in his ledger for 1759 records loaning to George Fairfax 5 loaves of double refined sugar, weight 48 pounds valued at 2 shillings a pound, and 55 pounds of single refined sugar. Just as we sometimes refer to the stone, bronze, or the iron age, we might well characterize the present as the sweetest time in history and refer to it as the sugar age.

When we speak of "sugar" we mean ordinarily the white or brown crystalline substance obtained from cane or beets with which we fill our sugar bowls. But to the scientist that term is misleading; for he knows many sugars—all having certain characteristics in common, to be sure, yet all differing in such qualities as molecular structure, source, and availability as food to various organisms. To become familiar with all the various kinds of sugar, their chemical structure and behavior, their reactions, sources, derivations, isolation, and commercial production is a very large job indeed.

The Purest Food Available

The process of manufacture developed through long years of experience is now so successful that sugar represents the purest food material which has ever been available. In fact it is so pure that from some standpoints, especially when it makes up a large proportion of the diet, its very purity is a disadvantage because minerals, and particularly vitamins, have been removed. Without question, the brown sugar and New Orleans molasses which our grandparents used in sweetening were more satisfactory dietary items than the purer more beautiful white sugar which we now use.

The chief sources of all the millions of tons of sugar we buy and use annually are the sugar cane and the sugar beet, but smaller quantities of sugar are secured from other plants—sorghum, the maple tree, palm, and even the watermelon. I wish that I had space here to detail the romantic story of the introduction of sugar cane into the West and its cultivation as a source of sugar, or to tell you how Napoleon, blockaded by the British, stimulated the development of the sugar beet and inspired the first Vilmorin to initiate his experiments on the selection of sugar beets for high sugar content. Politics, economics, tariffs, murder and piracy, the airplane, the principles of genetics, a view of social and political systems, as well as many phases of science would be drawn into such a story.

Manufactured By Plants

All green plants make sugar from carbon dioxide and water in a process called photosynthesis, which is probably the most important chemical process from our standpoint which occurs outside our own bodies: im-

portant not only because all the sugar we eat results from it, but also for a number of other reasons.

The exact chemical process involved in photosynthesis is not yet understood. As in many other similar instances we know it chiefly by its results and for practical purposes we can express it by a formula as follows:

$$6CO_2 + 6H_2O = C_6H_{12}O_6 + 6O_2.$$

(carbon dioxide) (water) (sugar) (oxygen)

From this sugar all the other materials made in the plant are derived. The oil of peanuts, soybeans, castor beans, corn grains, or coconuts is formed from the sugar made in photosynthesis. The cellulose, the pectic compounds and other constituents of the cell wall are made from sugar; thus lumber and cordage, cotton cloth, paper, and such products once were sugar. Proteins are made from sugar and nitrogen, with usually sulphur, phosphorus and other minerals absorbed from the soil. Flavoring matters, perfumes, and pigments, even vitamins, are also derived from sugar. All the numerous and varied organic compounds found in plants may be traced back to sugar, and as all our food comes directly or indirectly from plants, our very bodies are built from it or its derivatives. We may say that sugar, as the product of photosynthesis, is the point upon which rests an inverted pyramid of all the thousands of organic compounds found in living bodies.

The Energy in Sugar

As we have seen from the chemical equation, oxygen is liberated as a by-product of photosynthesis, and this is essential for the maintenance of our lives.

There is, however, a very important aspect of sugar other than its significance as a basic substance from which other substances are made. Sugar contains stored energy and when it is burned or chemically broken up this energy is set free as heat which may be transformed into other forms of energy, such as light or electricity, and made to do work. The energy which the sugar contains comes from the sun, and in the process of combining CO_2 and H_2O into sugar part of the light energy is stored in the sugar. For instance, every gram molecule of glucose contains 373,000 gram-calories of heat and when the sugar is burned that much energy is set free. When cell walls or oils or proteins are constructed from sugar much or all of the stored energy is preserved in the wood, the oil, or the protein of the new material for further use.

The energy which enables us to move and work and that which maintains our body temperature comes from the food we eat, and it is set free from our food in respiration. For sugar we represent the process thus:

$$C_6H_{12}O_6 + 6O_2 = 6H_2O + 6CO_2 + 673{,}000 \text{ gm. cal.}$$

But this represents only the beginning and end of the process, which probably involves stages producing various acids and other compounds until it finally reaches the stage of carbon dioxide and water. The well known insulin as well as Vitamin B_1 or thiamin play a part in this process. A wonderfully complicated yet extremely important process is the decomposition of sugar in the body—a process sometimes referred to as intermediary metabolism of carbohydrates.

It is important, as I have pointed out, because it is the way in which the energy from the sun stored in sugar through photosynthesis is set free in the body. The work I do in writing this comes from the energy set free from the food I ate. The energy in that food comes from the sun so I might say that these words are in a sense celestial in character since they are in the last analysis due to the sun.

Man is unique in one respect, he not only uses the stored energy of food for vital processes, but he uses stored energy in other ways also—for heating houses, for light, for transportation, for manufacturing Of all living creatures man alone does this. The bear, the butterfly, the tree are limited to the free energy secured in respiration from food in their bodies. Man alone has learned to release and use the stored energy of coal, wood, oil and waterpower.

There was a time when all the energy man controlled and used was that which he himself secured from the food he ate or from brute animals. The pyramids were built by this energy. Then man developed water-wheels, windmills, and finally machines run by the energy derived from coal or petroleum. In fact, our present civilization depends upon the dissipation of large quantities of energy stored in ages past by photosynthesis in sugar transformed into wood, coal and oil.

Plants make this sugar in organized bodies in the cells of the leaves, called chloroplasts, and the chloroplastid pigments are essential for the process of photosynthesis.

Sugar to Supply Man's Needs

The average production of sugar by a leaf is about 1 gram of glucose per square meter per hour, or 10 grams in a 10-hour day, which may be taken as the average day length during the growing season. A man requires between 3,000 and 4,000 kilogram-calories per day and this amount of energy is contained in 800 to 1,000 grams of glucose. Since a square meter of leaf makes only 10 grams of glucose per day, it would require between 80 and 100 square meters of leaf surface to supply a man with the food he requires. If we had chloroplastid pigments and were green instead of white, pink, brown or yellow, it would be possible for us to make part of the food we need merely by standing in the sun all day. But the total area of the human body is not more than 1 or 2 square

meters, and if we were as efficient in making sugar from CO_2 and H_2O as the green leaf is, we should need to expose from 80 to 100 square meters to the light. It is quite clear that to attain this ideal, modifications in our body structure permitting the exposure of a greater area would be necessary. For example, we might have our ears enlarged to structures 7 or 8 yards in diameter or our lips extruded into a semicircle 10 or 12 yards in diameter, which we could stick up into the air and orient suitably to catch the light, or have fingers 30 feet long and webbed with thin green tissue. Such thin extended surfaces would require support of some sort, say ribs of cartilage, and would bring various complications. The greater loss of water from such extended areas would require us to drink more. A few minutes exposure to cold weather would freeze such tissue, and windy days, even though the breeze was mild, would be a source of considerable difficulty because of the sail-like character of the tissue exposed. By breaking the tissue up into small units a few inches square and having each hinged upon a support, wind resistance could be reduced. We would need between 16,000 and 20,000 such units say 3 inches square, which would add to the decorative effect; though even under such circumstances some kind of anchorage would be necessary if we were not to be blown over by every passing breeze. Anchorage means that movements would be circumscribed; we would have to stay in one place and, to avoid the freezing in cold weather, it would be necessary to drop our photosynthetic area in the winter and hibernate. In fact, if man were to develop chlorophyll and make his own food, he would have to become a tree.

Some Horticultural Portraits

By Eleanor C. Marquand

IN the fifteenth century there seems to have arisen a fashion which lasted three hundred years or more of representing botanists and horticulturists holding their favorite flowers, or rather, perhaps, the flower they were most proud to possess. Typical of such portraits, engraved or painted, is the print which forms the frontispiece of Gerarde's Herbal, and shows the author holding potato blossoms, reminding us of his touching pride as a horticulturist in growing this plant of which he wrote: "It groweth naturally in America, where it was first discovered, as reporteth Clusius, since which time I have received roots hereof from Virginia, otherwise called Norembega, which grow and prosper in my garden as in their own native country."

A print of the Italian botanist, Fabio Colonna, engraved in 1606, shows him holding a columbine, and Parkinson's portrait, holding some

kind of composite, appears in the fascinating frontispiece of his Theatrum Botanicum of 1640. Of the four vignettes here depicting the four quarters of the globe, that representing America combines the two continents with a charming impartiality. It shows, besides a figure astride of what is presumably a llama, the earliest known European representations of cacti, of which two varieties appear, also a sunflower, a pineapple, and the passion-flower which roused such excitement among the early missionaries to the New World, that they composed for it an elaborate religious symbolism, declaring it had been "designed by the great Creator that it might in due time, assist in the conversion of the heathen among whom it grows."[1]

During the Commonwealth in England, when the craze for tulips had swept over Europe, a pack of cards was published, showing on the eight of hearts a portrait of the Parliamentarian general, Lord Lambert, one of the greatest tulip fanciers of the day. In his right hand he holds a tulip and beneath is written: "Lambert Kt. of ye Golden Tulip."[2]

Long antedating these, however, are numerous painted portraits, showing the artists' models to have been interested in various different flowers, the one perhaps most frequently appearing being the carnation, or "clove pink," so named because its perfume seemed to suggest the spicy odor of cloves.[3] This flower, a native European plant, bore, in its wild state, small single, five-petaled flowers, flesh-pink in colour, which were loved for their perfume and were among those associated with the Virgin, sometimes replacing roses in paintings of the Mother and Child. The name "carnation" is believed by some to be derived from *carno, carnis,* the Latin word for *flesh* in reference to the original color of the flower. According to Bailey's Standard Cyclopedia of Horticulture, in the latter part of the fifteenth century gardeners first noticed natural variations in the coloring of these pinks, and by experimentation they managed to break up the original flesh-pink color into its component red and white and then to produce double flowers. It was not, however, as he says, "until the beginning of the sixteenth century that the development of the carnation into numerous varieties made an impression upon its history." Variation upon variation followed as the gardeners of the Continent and England vied with one another in producing novelties, launching a veritable craze for this flower, comparable in a small way to the famous "Tulipomania" of the next century. In 1597 Gerarde wrote, "To describe each new variety of carnation were to roll Sisyphus' stone or number the sands." No wonder, then, that we find many portraits of both men and women holding a specimen of the

[1] M. F. Baker. Florida Wild Flowers, p. 146.

[2] Joan Evans. Pattern—A Study of Ornament in Western Europe from 1180 to 1900. 2 vols. Clarendon Press, Oxford, 1931.

[3] See Bartholamaeus Bruyn, "Lady Holding a Pink," Brussels, Palais des Beaux Arts; Hans Holbein the younger, "Portrait of Sir George Cornwall Holding a Pink," Frankfurt-am-Main, Städelisches Kunzt Institut; Memling "Man with a Pink," New York, Morgan Library; etc., etc.

Portrait of a young man by the "Maître de Moulins," holding a primitive form of cockscomb.

Portrait of a man with a large hat, holding a pink in his right hand. Flemish school.

ortrait of a man, by Ambrosius Benson. These ree portraits are reproduced by courtesy of the ohn G. Johnson Collection in Philadelphia.

The Man with the Pinks, ascribed to Jan van Eyck, but believed to be the work of a later artist. Berlin.

ohnson Collection in Philadelphia.

latest variety of this flower. In the Kaiser Friedrich Museum in Berlin is the portrait of a man holding pinks which has, in the past, been attributed to Jan van Eyck, and has been supposed to have been painted about 1425. Modern critics doubt this attribution and incline rather to date it at the end of the century. As the pinks the subject of the portrait is holding are small single flowers, red and white in color, such as we know were not produced until late in the century, they could not have been painted in 1425, hence they serve as important witnesses to prove that the picture is not by Jan van Eyck!

In the Johnson Collection in Philadelphia is the portrait of a man painted by some Flemish painter in 1524. He holds a single flesh-colored pink which is convex in outline, rather than lower in the center like the original pinks, and also it is much larger in size. This flower must represent the first step in the development of the double carnations, very round in profile, known to the French today as "Flamands," or the Flemish type. The Johnson Collection, through whose courtesy these photographs are reproduced, also possesses two other horticultural portraits of great interest. One of these, which is by the fifteenth century French painter known as the "Maître de Moulins" shows a young man holding a primitive type of red celosia or cockscomb. As this flower seems not to figure in classical literature, or to have any symbolic or religious significance and no recognized medicinal properties, it would appear to be used in this portrait for its horticultural interest alone. A native of India and the Far East, it was probably introduced into Europe at a relatively late date. Johnson's Gardeners' Dictionary says three varieties of this plant were introduced into England in 1570, which would seem to imply that the original type must have been known for some time previous to this date on the continent.

The other horticultural portrait in the Johnson Collection is by the Flemish painter Ambrosius Benson, and shows a young man richly dressed in black, with keenly intelligent dark eyes, and a close-cut beard, very unusual at that period. In his right hand one sees part of some instrument which I have been unable to identify, and in his left a rather unrealistic rose-bud. This is large, not the bud of a single flower, and shows somewhat exaggeratedly foliaceous sepals, and the petals are a brownish purple, probably owing to a change in the pigments during the four centuries since it was painted. It must represent either *Rosa gallica* or *Rosa centifolia*, the only double roses then known in Europe, each of which had red varieties and foliaceous sepals. Above the young man's head is the date, 1525, and on the left one reads "ANOS 27."

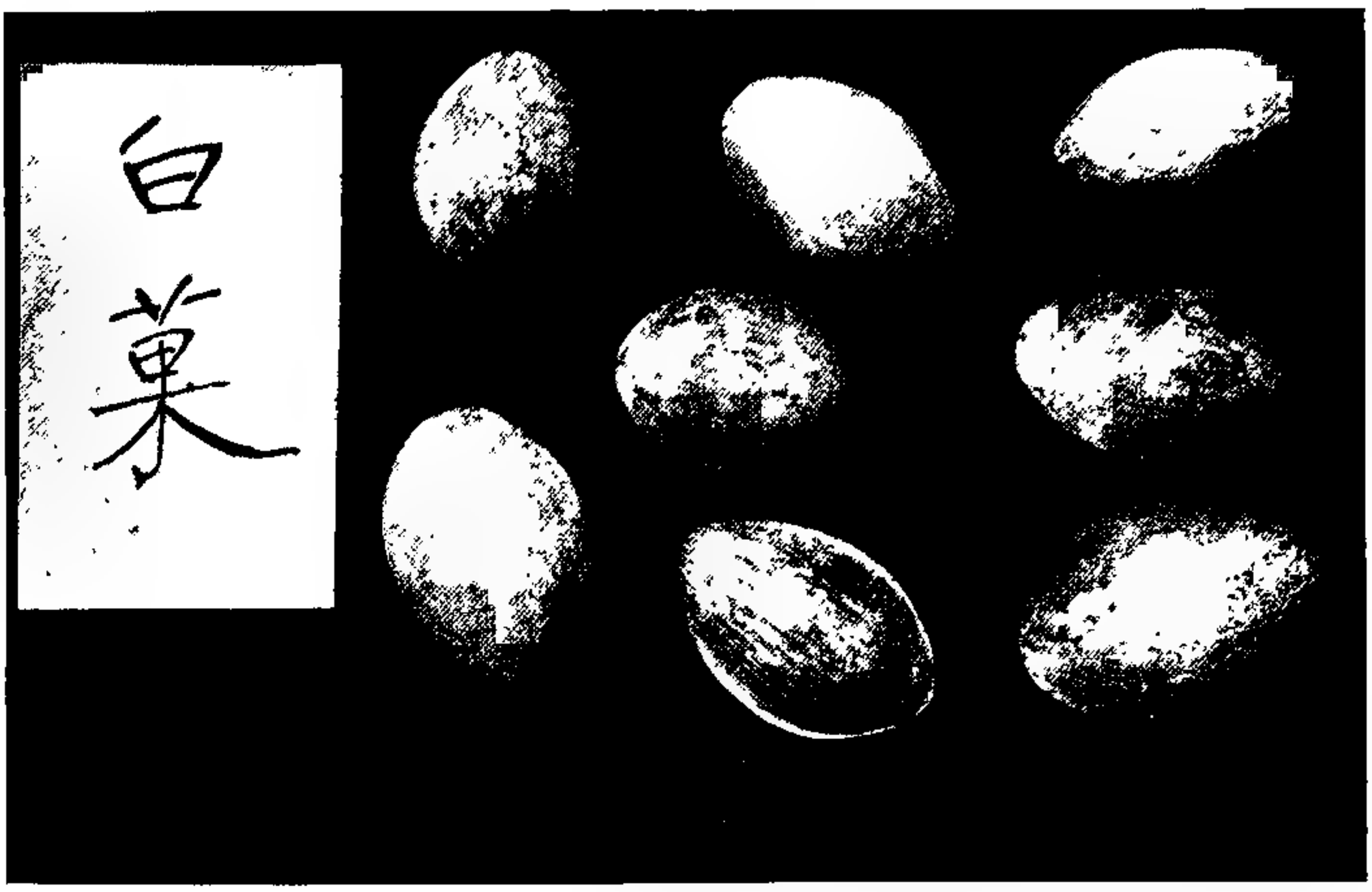
In considering the portraits to which reference has been made, it would seem that the custom of representing individuals holding flowers is probably frequently due, not so much to a mere whim of the painter, as to a wish to suggest some botanical or horticultural interest on the part of the men and women portrayed.

Seeds of the Ginkgo

By W. M. Porterfield

(No. 9 of a series on Chinese Vegetable Foods in New York)

IN one of the most interesting and informative of recent articles on the ginkgo tree[1] reference was made to the uses of the seeds. I should like to add to the facts therein presented because in New York's Chinatown one of the most commonly seen foodstuffs in the shops—and one which draws the interest of the curious and the student alike on account of their deep historical background—are ginkgo seeds, or Pak-ko, as they are called by



Ginkgo seeds as sold in the shops in Chinatown, New York. The Chinese character reads "Pak-ko" meaning "white fruit."

the Chinese. The description of the seed contained in Mr. Detwiler's article is clear and need not be repeated. One or two interesting details, however, might be added.

Although in point of age the ginkgo is the only living survivor of a very ancient family and therefore ranks among the "first families" of trees, it was made known to Europeans only in comparatively recent times. Kaempfer about 1690 discovered it in Japan[2] and described it in his

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[1]Detwiler, S. B. The Ginkgo. Soil Conservation **4**: 122-124. 1938.

[2]Sprecher, Andreas. Le Gingko biloba. Institute of Botany, University of Geneva, p. 3. 1907.

Amoenitatum Exoticarum published in 1712. Dr. Clarke Abel[3] naturalist with Lord Amherst's embassy at Peking in 1818, noted the sale of the fruit of the ginkgo but did not know its uses. Jacquin in 1819[4] made drawings of the leaves and male flowers. Mention was made of a fruiting tree in Vienna, then A. P. de Candolle discovered one at Bourdigny near Geneva. The first illustrations[4] of the seed and its parts were made in 1826 by L. C. Richard, who was a specialist in conifers. The tree from which they were drawn was the only known pistillate tree in Europe at that time. It had been planted about 1790 and scions from this tree were grafted on staminate trees in many European gardens.

It is interesting to note that the name "ginkgo", which has survived to become the botanical name of this tree, was given to it originally in China, in the province of Fukien,[5] where the Dutch, landing there for the first time, heard it being used. It means "silver fruit". The name was accepted and used in Japan but the spelling was changed from "Gin-ko" to "Ginkgo". The Chinese name Pak-ko means "white fruit", referring of course to the seeds, and is the accepted common name of the ginkgo there. The tree acquired both of these names because of its fruits and seeds.

Although the male trees bloom in the early spring the fruit does not mature and ripen until the first frost comes. After flowering of the pistillate trees many of the fruits abort and fall off. Those which do survive mature and the seeds are viable. When the ripe fruit begins to drop, in whatever public spot in New York the tree happens to be, one will inevitably come across a Chinese or two with a basket gathering the fruits from the ground.

The fruits look like small plums but the flesh is tough and has a very offensive odor, one reason why some people object to the tree for ornamental purposes. In order to remove the fleshy part, the fruit may be treated with salt water or simply thrown into a vat of water, as is done in China, and allowed to ferment. Chemically the pulp contains a series of fatty acids from formic to caprylic and including acetic, butyric and others.[6] Besides a resinous quality the fruits are bitter to the taste and are astringent in effect.

The smooth roundish white almond-like seeds have two longitudinal ridges, sometimes three. The Chinese say[7] that the three-angled seeds produce staminate trees and the two-angled ones pistillate trees. The seeds when eaten raw are toxic to some people and on rare occasions have even

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[3]Bretschneider, E. History of European Botanical Discoveries in China. p. 709 1898.

[4]Sprecher, Andreas, in loc. cit. p. 5.

[5]Graf von Schwerin, Fritz "Uber die Schreibweise der "Ginkgo". Mitt. Deutsch. Dend. Gesellsch. **32**: 93. 1922.

[6]Wehmer, C. Die Pflanzenstoffe, p. 2. 1911.

[7]Stuart, C. A. Chinese Materia Medica. pp. 390-391. 1911.

A short leafy branch of Ginkgo biloba with young fruit split open to show the seed.

proven fatal. A sort of dermatitis may result, or as Mr. Detwiler pointed out, swollen glands. According to Chinese medical lore ginkgo seeds when eaten raw will destroy cancer.[7] This might be worth investigating. In order to be eaten safely they must be cooked or roasted. Europeans and Americans do not fancy ginkgo nuts but both Japanese and Chinese eat them as an appetizer, as a tasty ingredient with certain dishes, or after the meal to aid digestion.

Sprecher[8] states that the kernel of the ginkgo seed contains only starch whereas that of most of the other conifers contains oil. This is further supported by analyses of the seeds made by Blasdale (1899), Suzuki (1902), Langley (1907), and Read and Liu (1927).[9] The dry kernels contain from 62 to 68 per cent of starch, the only instance of its kind among the conifers. Another analysis by Suzuki in 1902[10] definitely established the fact that in addition to starch the seeds of the ginkgo contain 6 per cent of cane sugar. Other constituents in the dry seed kernel are protein, 11-13 percent, and fat, 1.5–3 percent.[9] Starch, then, and not oil, is the chief constituent of the kernel, contrary to the statement of Dr. E. Lewis Sturtevant[11] who states that the seeds furnish an oil used for eating and burning. Stuart[7] in his account mentions the fact that sometimes the Chinese use the seeds to wash clothes and that they may be digested in wine or oil to make a kind of detergent cosmetic. This is because of the fatty principle present.

The seeds are viable and will germinate when planted, but in my experience the seedlings grow very slowly. Suckers from the base of an old tree are much more vigorous. While the tree is known to be immune to insect injury to a high degree, Sprecher says that the seeds once planted may become inhabited by a worm of the genus Oxyuris[12] which finds in the seeds suitable food.

A fine photograph of a ginkgo tree may be seen on page 198 of the Journal of the New York Botanical Garden for September 1938.

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[8]Sprecher, Andreas, in loc. cit. p. 177.

[9]Blasdale, W. C. A Description of Some Chinese Vegetable Food Materials. U. S. D. A., O. E. S. Bull. 68:45. 1899. Suzuki, U. The Composition of the Nuts of *Ginkgo biloba*. Bull. Coll. Agric. Tokyo Imp. Univ. Japan **4**:357-358. 1902. Langley, R. W. The Composition of some Edible Seeds from China. Journ. Am. Chem. Soc. **29**:1513-1515. 1907. Read, B. E. and Liu. J. C. Plantae Medicinalis Sinensis. Flora Sinensis, A. I. p. 59. 1927.

[10]Suzuki, U. On the Occurrence of Cane Sugar in the Seeds of *Ginkgo biloba* and *Camellia thcifera*. Coll. Agric. Tokyo Imp. Univ. Japan **4**: 349-350. 1902.

[11]Sturtevant, E. L. Notes on Edible Plants. p. 290. 1919.

[12]Sprecher, Andreas, in loc. cit. p. 122.

The Devil-flower Of The Monsoon Forest Of Malay

By H. W. Rickett

AMONG the oddities of the plant world we may place *Tacca Chantricri,* which finds a place in conservatories not for its graceful form or its pleasing color, but for quite opposite qualities.

Its large glossy leaves suggest one of the aroids, and like them it flourishes in the warm moist air of tropical forests. Among the clustered leaf-stalks rises a long stem tipped by a curiously formed cluster of flowers. Both these and the spreading bracts which form their background are of a sinister brownish-purple hue. Among the flowers grow long hair-like bracts which hang like whiskers from a face. The result rather suggests a small dark brown ogre of oriental aspect; the English gardener calls the plant the Devil-flower.

In spite of its unwholesome aspect the plant has nothing poisonous in it. A closely related species, *T. pinnatifida,* the South Sea arrowroot, is used for food by natives; the name *Tacca* is said to be derived from the word used by the natives of Amboina for this edible species. Since primitive medicine is often associated with devil-worship, the somewhat malignant aspect of *T. Chantrieri* may be responsible for its reputed virtues. The natives consider it especially effective against falling hair (because of its long whiskers?), toothache, and stomach-ache.

The flower-cluster has been often called an umbel, but this is obviously an error. The largest and oldest flowers are in the center, whereas an umbel flowers from the margin inwards. Exact studies have shown that the compact and umbel-like cluster is really cymose; that is, the first-formed flower terminates its branch. Below this flower is a pair of bracts, the broad brownish-purple leaves so conspicuous in the inflorescence. In the axils of these bracts grow more flowers, which in turn have bracts, these being the first of the pendent "whiskers." In *their* axils grow flowers which bear more whiskers, and so on. A characteristic cluster had 12 flowers and 14 hair-like bracts; the last few bracts sending up no flowers from their axils. The apparent umbel of *Tacca* is really a pair of very close-knit cymes (technically scorpioid cymes or cincinni). A similar inflorescence is formed in the genus *Allium,* which includes the onions, and in such genera as *Narcissus* and *Hippeastrum* of the Amaryllidaceae. These plants also have been mistakenly described as umbellate, and a recent attempt to reclassify them has used their "umbels" as an index of relationship. *Tacca* has been considered related to the aroids, to *Dioscorea,* to *Aristolochia,* even to the orchids. At present it is placed in a family of its own, Taccaceae, near the amaryllids.

Tacca Chantrieri, the Malayan "devil-flower." Below is a view of the bracts from the rear.

Roots which form above the ground are shown here piercing the base of the leaves in Tacca Chantrieri

The flowers themselves are unique in structure. The perianth is of 3 outer and 3 inner segments, all of the same dingy color. The 6 stamens have the form of large hoods; these are the filaments, and within them the small anthers are concealed. In the center of the flower rises a spreading 6-lobed disc, the style; the three stigmas are small openings beneath the margins of this parasol. The agent of pollination is not known. Small flies have been suggested, and certainly the peculiarities just described suggest that the pollen must be carried by some small beast that can creep into the hooded filaments and under the style and up their overhanging surfaces. One botanist, anxious to "explain" all the visible parts of the plant, even suggested that the long pendent bracts serve as means by which insects can crawl up to the flowers; but none has yet been seen crawling up them, and the spreading bracts suggest rather a lure for flying insects. The inferior ovary has a 3-branched single cavity, on the 3 ridges of which develop numerous kidney-shaped seeds. The whole inflorescence finally droops and from it hangs a singularly unattractive cluster of dirty-black fruits.

The stem is partly underground. The upper part is enveloped by the

overlapping leaf-bases, through which break numerous roots. These finger-like fleshy roots, formed above-ground, make a tangled growth characteristic of many plants of tropical forests. The edible tubers of *T. pinnatifida* are branches of the stem which similarly grow downward into the soil.

About 25 species of *Tacca* are known, from various parts of the tropics of both hemispheres. *T. Chantrieri* and a number of others are natives of the monsoon forest of the Malay peninsula and adjacent Indo-China. Other species are found in Java, Sumatra, Borneo, Polynesia, the Philippines, Hawaii, Ceylon, Madagascar, and central Africa. Only three or four species seem to be known in American conservatories.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Up-to-date Reference Work for a Botanist with a Microscope

PLANT MICROTECHNIQUE. Donald A. Johansen. 523 pages. Illustrated and indexed. McGraw-Hill Co., New York, 1940. $4.50.

Recent books on microtechnique have been written and edited mostly by zoologists, the parts of interest to botanists being condensed into a short chapter or two. Older works by botanists are long out of date. There has been no textbook for the student of botanical microtechnique, no reference work useful to the botanist with microtechnical problems. These wants are well filled by Dr. Johansen's book.

The first section deals with general methods; successive chapters take up Apparatus, Reagents, Killing and Fixation, Stains, Staining Procedures, and various special methods. The treatment is detailed but not encyclopedic. Many proposed methods and reagents are omitted because "it was concluded after thorough trial that they had not demonstrated their superiority over accepted procedures" (p. vii). Directions are simply and clearly written. The author succeeds admirably in anticipating the small troubles that plague the budding technician and in sharing with him the fruits of a long and wide experience. Among the minor errors that can be corrected in a future edition we note the consistent mis-spelling of Feulgen (pp. 69, 94, 495). With the preservatives for plant material discussed on pp. 105-106 those devised by Scully should certainly be included. The influence of the fixing agent on staining is clearly described; one could wish for at least brief mention of the relation between staining of protoplasm and reaction of the medium.

The second part treats systematically the methods appropriate to the different "phyla" of plants. Several questions are raised by this part. Some of the bulk of the book is due to the inclusion here of notes on comparative morphology and geographic distribution. Are we to look in a work on technique to learn that "*Conocephalum* is a larger plant in all respects than *Marchantia* and is frequently to be found where the latter does not grow" (p. 367)? And while it is true that "the ferns are a large, diverse, and extremely interesting group" (p. 381), it may distress some botanists to find the lycopods under that head. In short, this part of the book might, in the opinion of this reviewer, be substantially reduced and be no whit less useful to the technician or the student; in fact, even more useful.

Palaeobotanical methods and photo-

micrography are wisely omitted. The lack of some treatment of the microscope may be questioned, since the student must learn microscopy with his microtechnique. There are 110 figures, mostly beautiful photomicrographs illustrating the second section. The valuable bibliography contains about 250 titles; among which scarcity of any earlier than 1925 is an index to the rapid growth of the subject and the need for the book. In binding, typography, and general appearance the book conforms to the high standards of the McGraw-Hill publications in botany. This is a valuable contribution to the teaching of botany and deserves a place on the reference shelves of most botanists.

H. W. RICKETT.

Personality in Weeds

JUST WEEDS. Edwin Rollin Spencer. 316 pages, illustrated and indexed. Scribner's, New York, 1940. $2.75.

"Dedicated to My Two Smartweeds, Malcolm and Jean Spencer." Thus does Edwin Rollin Spencer, Professor of Biology at McKendree College at Lebanon, Ill., begin his fascinating account of weeds which Scribner's have made into a very attractive book. Dr. Spencer does not try to make his book a manual in either a scientific or a practical sense; as he announces, a few excellent botanical works and other books and bulletins have done this.

Just Weeds will interest both the layman and the botanist; the book contains a great deal of information one or the other is apt not to know. Furthermore, Dr. Spencer sketches the personalities of the weeds—something over 100 of them—in such a way that they are not merely pestiferous plants with which one has some acquaintance. They take on characters which make them even deserving of some admiration. After all, the author says, a weed "is a plant out of place in the eye of man; in the nice eye of nature it is very much in place."

Control and eradication measures are considered for the most troublesome weeds, and one is reminded frequently that a redeeming feature of most weeds is their value as green manure underground. Crab-grass is made to appear almost beneficent in this respect. The principles in destroying perennial weeds which have spreading and deeply entrenched underground stems is well told under Man-under-ground (*Ipomoea pandurata*) and Canada Thistle—a simple story for every gardener to take to heart.

In the body of the book systematic arrangement is wisely disguised under common names, with the scientific ones in brackets underneath. Both names are explained logically and with imagination, second-choice and colloquial names adding flavor and more country-wide appeal. Bouncing-Bet, it appears, has 15 other serviceable appellations, of which Lady-at-the-gate and Wild Sweet-William seem acceptable enough, but it seems questionable that such an obviously faulty one as Soapwort Gentian (clearly to be reserved for *Gentiana Saponaria*) should be given any encouragement. The explanation of the names' meanings must persuade the most prejudiced anti-scientific-names reader that in general the Latin names are neither meaningless nor difficult; most of them have a helpful story to tell, and they do this with admirable brevity.

The need for editorial system and conformity in our horticultural writings generally is shown in the disregard for uniformity in the use of capitals and hyphens, as in such names as Cure all, Bird's-nest, Devil's plague, Queen Anne's Lace, Horse weed, Giant ragweed, horehound, Dogbane, and milkweed—copying the spelling of the text.

The technical description for each genus and species which follows Dr. Spencer's picture of the weed personality has been reprinted from Robinson & Fernald's seventh edition of Asa Gray's New Manual of Botany.

Miss Emma Bergdolt's sketches for 102 plants we may call weeds make one doubt the justice of the name; every one is beautifully delineated with a fine exactness for botanical details and is handsomely reproduced. They are the crowning touch of this useful book.

BEN BLACKBURN,
Rutgers University.

With Their Feet in the Water

A MANUAL OF AQUATIC PLANTS. Norman C. Fassett. 382 pages, illustrated and indexed. McGraw-Hill, New York. 1940. $4.

Dr. Fassett's Manual of Aquatic Plants is a useful book, but it is rather an illustrated key than a true manual,

as it contains very little descriptive matter. The book covers not only the true aquatics, but also many swamp, bog, marsh, and wet-ground plants, even a number of trees and shrubs in spite of the fact that the author states that bog habitats are excluded. He protects himself, however, in his introduction by saying that the subject matter is a moot question.

The method of having the figure number follow the name of the plant is one that is bound to lead to confusion, especially for the amateur. Perhaps the book is intended only for professional use.

Botanically, one questions the naming of forms and varieties of aquatic plants, as their variations depend so much on depth of water and content of the soil as to render them unstable and of no taxonomic value. But perhaps that has been done for the amateur.

E. J. ALEXANDER.

King of the Bone Hunters

O. C. MARSH. Pioneer in Paleontology. Charles Schuchert and Clara Mae Le Vene. 541 pages, illustrated, indexed, and with bibliography. Yale University Press. New Haven. 1940. $5.

With evident loving care, the authors have sifted through the life and records of this, the most eminent of the American vertebrate paleontologists and have not only given an accurate account of the man and his work, but have presented it in a forthright and interesting manner. Living as he did athwart the golden age of American scientific exploration, it is of unusual interest to follow the role Marsh played in the expansion of biological thought.

Although the book is mainly concerned with the growth and development of vertebrate paleontology, Chapter IX—Marsh's Contributions to the Evolution Theory—will be of particular interest to the general reader. Here is an engrossing account of the interplay of intellects, the mutual stimulations, the moulding and redirecting of concepts, such as come only from personal contact and discussion. It portrays the meetings and conferences, the correspondence and pertinent public communications between Marsh and such men as Charles Darwin, Asa Gray (representing the botanists), Thomas Huxley, Herbert Spencer, and others; a group of men who, seeking after Truth, were not afraid to reveal their conclusion to an often antagonistic world. For the reader interested in the development of biological thought in America—and the scientific world in general—this chapter is particularly recommended.

W. H. CAMP.

Yearbooks from the Societies for Amaryllis and Delphinium

Two yearbooks of important plant societies contain reports on work being done at the New York Botanical Garden, as well as valuable information on the culture and identification of the plants concerned.

Amaryllis

HERBERTIA 1939. Edited by Hamilton F. Traub. 258 pages, illustrated. American Amaryllis Society, Orlando, Fla. 1939. $3.25.

In the 1939 volume of Herbertia, published by the American Amaryllis Society at Orlando, Florida, with Hamilton P. Traub as editor, Edward Steichen writes "On the Status of the Daylily," and speaks with high praise of the work of Dr. A. B. Stout. "If the best daylilies that Dr. Stout has produced during the last ten years could by some miracle suddenly become available to every gardener in the country," he declares, "I haven't the slightest doubt but that all but a very few of the previously known varieties would be willingly junked by any discriminating gardener." Mr. Steichen, who at the time of writing was the chairman of the Hemerocallis committee, has since resigned and Elmer A. Claar of Wilmette, Ill., has been appointed to succeed him. An autobiographical sketch and portrait of Dr. Stout appear in this issue, as he was one of the Herbert medalists of 1939.

The volume, which is dedicated to the Union of South Africa, contains, besides biographical, historical, and horticultural material relating to amaryllids there, a section of 125 pages on description, classification, and phylogeny of the group, and shorter sections on breeding, culture, regional activities, reports of the society's work, reviews, and a buyer's guide. There

are 44 plates, some being photographs, others drawings, and ten additional figures. "Newly Named Daylilies" is the title of an article written by Dr. Stout.

The society announces the forthcoming publication (in about two years) of a phylogenetic and taxonomic treatise on the Amaryllidaceae, following the Hutchinson system, by Dr. Hamilton P. Traub.

Delphinium

DELPHINIUM 1939. Edited by Dr. Leon H. Leonian. 109 pages, illustrated. American Delphinium Society, Ridgefield, Conn. 1940. $3.

Edward Steichen also figures prominently in the yearbook of the American Delphinium Society, for he is the society's president as well as one of the country's leading delphinium hybridizers. The cover is from one of his own color photographs, and an article on "Delphinium Experiences, 1939" bears his signature. The volume, which is dedicated to Charles F. Barber of Hoodacres, Oregon, who introduced the white delphinium into American gardens, is beautifully illustrated with photographs and contains articles from delphinium growers the country over.

The work being done by Thomas Laskaris, to whom the society awarded a year's fellowship for study of delphinium diseases, particularly delphinium crown rot, at the New York Botanical Garden, is covered in a comprehensive and well illustrated report. A previously undescribed organism which is believed to be the cause of delphinium crown and root rot is also the apparent cause of a leaf blight, a local stem necrosis, and canker, Mr. Laskaris says in his summary. Further experiments on the fungus are now being carried out.

CAROL H. WOODWARD.

Tree Study for Grade Schools

MEN AND TREES. Joseph Gaer. 118 pages. Illustrated and indexed. Harcourt, Brace and Co., New York, 1939. $1.25.

To me, this book has opened an original place for itself in the field of conservation by giving the past, present, and the future. In 115 pages, the author has given in concise sentences and in brief paragraphs a vast fund of information delightfully presented in simple, readable English. Here, in one little book, we have scientific practice, human disregard for forests, no thought for the future on the part of the average citizen, scientific research and practical knowledge. This book gives Pilgrim and Chinese forest history, an early attempt to improve forest conditions, and an outline of many new forest industries.

I recommend the book for the Teachers Library and as a text book for the sixth and seventh years in school. I am glad, indeed, to have been given the opportunity to review this book.

MARVIN M. BROOKS, *Director, Nature Education and Garden Study, Board of Education.*

Community Gardening

GARDENING, SCHOOL COMMUNITY AND HOME. 60 pages, illustrated. National Recreation Association, New York, 1940. 50 cents.

An extremely practical book to be used as a guide for those who are directing school or community gardens (useful also to the home gardener) has been put out by the National Recreation Association, an organization devoted to giving every child in America a chance to play and every person in America "an opportunity to find the best and most satisfying use of leisure time."

The project to encourage organized children's gardens is a new one for the association, but one in which it is entering whole-heartedly, providing a full-time field worker to visit communities in order to help in developing gardening programs. Leaders are trained for this work, as part of the association's service.

The bulletin on gardening contains a useful bibliography and a list of sources of help for those who are planning gardens to be developed by organizations, schools or communities.

CAROL H. WOODWARD.

Fresh From the Tree

GROW YOUR OWN FRUIT. M G. Kains. 434 pages, illustrated and indexed. Scribner, New York, 1940. $3.50.

Here is a comprehensive work on the culture of fruit outdoors. Its title indicates it as a guide for the home owner who is anxious to produce fruit for his own table from his own property. It is considerably more than this. It is a guide for any fruit grower and worthy of a place on the shelf of anyone engaged in this occupation.

Did Mr. Kains not enjoy the reputation that he does in the horticultural world the perusal of this book would clearly demonstrate both his scientific and practical knowledge of the subject on which he writes. Not only does the author give implicit instructions as to the culture and care of the various fruits but also devotes chapters to the related operations, such as selection of soil, stocks, suitable tools, storage, etc. The instructions on training, so vitally important to the young tree, pruning, grafting and budding, always an intriguing subject to the amateur, are very clear. The illustrations are good, in that they are not selected as embellishment to the book, but to demonstrate noteworthy operations and important points. Part II of the book is a complete directory of fruits for all sections of the country.

Apart from the instructive angle of this work, it contains a definite appeal to those who are able and willing to grow their own, to help themselves to the thorough enjoyment to be obtained by partaking of tree-ripened fruit. To the uninitiated the author's enthusiasm for this product, noted several times, may sound over-emphasized, as for instance in the latter part of the last paragraph on page 159. Let me say here that to anyone who has eaten such fruit—for example, "Pineapple" nectarines gathered when ripe, the aroma from one of which would fill a room, or apricots, or Coe's Golden Drop and Green Gage plums from wall trees, gathered when ready to drop—these words have a very real meaning and they are not illusions the result of a youthful healthy appetite.

Mr. Kains lists many varieties of the various fruits noted for quality, but rarely seen offered in catalogues. Their obscureness is due primarily to the fact that they do not make good commercial fruit, that is, they do not pack and carry well, are unsuited for canning, lack visual appeal or some such characteristic. It is to be regretted, as many excellent kinds are liable to become lost to cultivation. The only sure way to perpetuate them is to "Grow your own fruit" and seek out these outstanding varieties. They are worth it.

EDWIN BECKETT,
Superintendent for
Mrs. Herbert N. Straus,
Middletown Farm, Red Bank, N. J.

Garden Chatter

BOUQUETS AND BITTERS. Julian R. Meade. Illustrated by John O'Hara Cosgrave, II. Longmans, Green & Co., New York, 1940. $2.75.

Julian Meade* has written an entertaining gardener's medley. It is light, gay and chatty. He takes us garden-visiting from Maine to Florida, into New Orleans, Mexico, California, and other points west. He meets celebrities here, and simple folk there, and exchanges ideas mostly on garden matters. Mr. Meade has a place of his own in Virginia where he gardens as he pleases, and probably very well, for he has horticultural knowledge and discrimination. Interspersed among the "bouquets" and the "bitters" are comments on flowers old and new and much that is interesting about herbs. The flower illustrations in black, white and blue are effective and well drawn.

HARRIET K. MORSE.

Some Brief Notes on New Books and Booklets

Crested Succulents

THE ENIGMA OF THE ORIGIN OF MONSTROSITY AND CRISTATION IN SUCCULENT PLANTS. J. J. Verbeek Wolthuys. 73 pages. Illustrated. Van Riemsdyck Book Service, New York. 1940. $1.

The author evaluates and devaluates the various theories that have been offered on the subject, showing wherein they are unsatisfactory. He ends up by suggesting that the theory of DeVries that heredity is a major factor is the most acceptable, but concludes that the entire affair is, as his title states, an enigma.

Flowers for the Table

AMERICAN FLOWER ARRANGEMENT. Opal M. Scarborough. 64 pages, illustrated. George Palmer Putnam Co., Hollywood, Cal., 1940. $1.25.

An unusual little book with emphasis on table arrangements and notes for special holidays and seasons.

* The untimely death of Mr. Meade has occurred since this review was written.

Dream Come True

I WANT A GARDEN. Corinne Johnson. 38 pages, illustrated. House of Field, Inc., New York, 1940. $1.

A New York and Baltimore woman develops the garden of her dreams out of a Connecticut pasture.

For the Dexterous Young

CHILDREN'S GARDENS. Edwin L. Howard. 64 pages, illustrated. The Studio Publications, New York, 1940. $1.

Written supposedly for the children themselves and telling them how to create a dozen different kinds of gardens, this book contains also plans and specifications for the construction of such small garden features as a rabbit hutch for a zoo garden, a rose-boat for a water garden, a tepee for a forest garden, a fireplace for a picnic garden. Plants for each type of garden are suggested.

Just That

TREE NEIGHBORS. Russell Doubleday. 103 pages, illustrated. Doubleday, Doran & Co. New York, 1940. $1.75.

Thirty-two familiar trees pictorially described and photographed (most of the pictures slightly out of focus) with an imprint of the leaf or the tip of a branch of each to head the chapter.

Classroom Guide

HOW TO KNOW TREES. H. E. Jaques. 152 pages, illustrated and indexed. Published by author, Mt. Pleasant, Iowa. 1940. $1 (spiral binding), $1.80 (cloth binding).

A booklet prepared for use in tree-identification classes, containing excellent sketches of the principal trees east of the Rocky Mountains, with many cultivated ones and some westerners included for class-work purposes. A useful type of illustrated key.

Current Literature At a Glance*

By Virgene Kavanagh

Heaths. S. K. Harris has a key to the "Heaths of the Presidential Range" in the fascinating June number of *Appalachia.*

Directory. Officers, directors, committee and zone chairmen, and club presidents are listed in the July number of the Bulletin of The Garden Club of America.

Braza. Early explorers in South America found a tree with red wood which gave a fiery red dye, *braza*, similar to a dye then imported from the East Indies. This dye led the Portuguese to make frequent trips to the eastern coast of South America, then called Santa Cruz, later known as the Brazil coast, and finally Brazil. The story of "The Tree that Changed a Country's Name" is told in *American Forests* for June 1940.

Fishers Island. A list of "Plants of Fishers Island" by C. C. Hammer appears in the May June number of *Torreya.* It should provide an interesting check-list for this area near New York.

Oaks. The School Nature League Bulletin for June is devoted to summer characters of some common oak trees. It has a key based chiefly on leaves, and pictures of leaves and acorns.

Bulletins. The New Jersey Agricultural Experiment Station has issued bulletins on "Diseases of the Gardenia" (679); "A survey of variability in white clover (*Trifolium repens* L.) and its relation to pasture improvement" (676); and (Circular 399) "B_1—Its use as a growth regulating substance for green plants" by John W. Shive. This circular on the use of vitamin B_1 should be of interest to the home gardener who has not obtained as much growth with B_1 as he had expected.

Ragweed. The anti-ragweed campaign is on. Circulars from the chairmen of the Ragweed Eradicating Committees of the Garden Club of Englewood, N. J. and the Washington (Conn.) Garden Club remind all readers to pull out ragweeds for the protection of hay-fever sufferers.

Lawns and Weeds. "New Lawns," "Lawn Maintenance," "The Control of Weeds in Lawns," and "Controlling Weeds with Chlorates" contain valuable suggestions for home gardeners. Novem-

* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

ber is the month to use dry sodium chlorate to kill weeds and the last-named bulletin gives the information needed to use it. These are all Cornell Extension Bulletins, Nos. 429, 430, 431, and 432, respectively.

Rent. "One Red Rose" by Maud M. Hutcheson in *Nature Magazine* for June-July 1940 relates stories of some of the strange rental fees exacted long ago by sentimental philanthropists.

Rarities. In the June 1940 number of *Natural History* 13 of the rarest trees of America are described and pictured. Several of these species are available for horticultural plantings. The distribution of the wild palms of Arizona is also discussed in this number.

Sturdiest. Shade trees which have best survived the combined disasters of the hurricane of 1938 and the ice-storm of 1940 are named by Dr. E. P. Felt in the June issue of the *Flower Grower.* Pin oak, American and European beech, honey locust, Norway maple, linden, tulip, European birch, flowering dogwood and the small magnolias the author recommends in place of some of the more common trees which have proved susceptible to storms. But the ginkgo and ailanthus, he says, while fairly resistant to storm injury and also to insect pests and diseases, for other reasons are not always desirable as street trees.

Walks. Besides the weekly field trips announced for the entire season of March through October by the Torrey Botanical Club, there are one-day and week-end trips scheduled in a vest-pocket booklet issued by the Hiking Trips Bureau at Ho-ho-kus, N. J., Edward A. Dench, Director. Copies are 10 cents each. A leader is appointed for each trip and complete directions for transportation and costs are published.

Wildflowers. A catalog of 267 species of flowering plants, not counting 20 different kinds of violets and a number of trees, has been listed from the Bowmans Hill State Wildflower Preserve at Washington Crossing Park, Pa. Besides, there are 70 fern species listed by Dr. Edgar T. Wherry.

Lumber. A survey of lumber production in the northeastern states over an average period of 14 years, with some figures going back to 1899, makes an imposing report. It is issued by the U.S.D.A. as Statistical Bulletin No. 70 and is the fifth of six which are planned to cover the United States. Kinds of wood, quantities, prices, and some of the uses are given, also comparative tables showing the excess of consumption over production.

Bridge-Grafting. A major job of bridge-grafting at the base of English elms where they had been seriously damaged over winter by field mice and rabbits is reported by W. E. Rose of Hinsdale, Ill., in the June issue of the *Arborist's News.* A series of photographs shows the results ot the operation, which was successfully carried out by inexperienced men.

Honey. Tables giving the names of important honey-producing plants and the dates when they are in full bloom are shown in Circular No. 554, "Honey and Pollen Plants of the United States" by Everett Oertel of the Bureau of Entomology and Plant Quarantine, recently issued by the U.S.D.A. Separate lists give many more names of plants that are valuable to bees, each state being treated separately. The four major honey plants, the circular records, are alfalfa, alsike clover, sweet-clover, and white clover.

Plane Disease. The July number ot *Arborist's News* is devoted to the disease which is threatening the sycamore or plane-tree. The authors are J. M. Walter, P. V. Mook and Curtis May of the Bureau of Plant Industry, U.S.D.A. This fungous disease is prevalent about Philadelphia and Baltimore but has been reported from Virginia, Kentucky, Mississippi, and several other states. It has killed several thousand trees. The first bark symptoms are dark areas elongated in line with the underlying grain—20 to 40 inches long and not more than 2 inches wide the first year. The cankers spread and kill the tree in from 3 to 5 years.

The leaves do not show injury for several years, not until the cambium is dead about the trunk; then the leaves turn yellow and fall in August or September the year before the tree is dead. The fungus forms spores which may be windborne but can be transmitted more certainly during pruning. All infected

trees should be removed and burned. If an infection is suspected, a fresh sample of the wood showing discolorations should be sent to the Division of Forest Pathology, U.S.DA., 8 Whippany Road, Morristown, N. J.

Kansas. Frank C. Gates has prepared a 266-page "Annotated List of the Plants of Kansas: Ferns and Flowering Plants" with maps showing the distribution of species. It is obtainable from the State College of Agriculture, Manhattan, Kan.

Bible Stories. Plants mentioned in the Bible are the subject of a mimeographed book of 135 pages prepared by Dr. H. N. Moldenke for distribution after his lecture of June 8 on "Plants of the Bible". Stories connected with 171 different plants are told in detail and an extensive bibliography is cited. Copies may be obtained from the author for 25 cents.

B. A. Krukoff Named Honorary Curator

B. A. KRUKOFF, who has long been associated with the New York Botanical Garden while working on his vast collections of South American plants, has been appointed Honorary Curator of Economic Botany at the Garden. The appointment was made at a meeting of the Board of Managers on June 20.

Mr. Krukoff, who was educated at the Imperial University of Kazan, Russia, and later received a B.S. degree at the New York State College of Forestry, Syracuse University (1928), has been engaged in plant exploration almost continuously since completing his work at Syracuse. His first year, beginning in June 1928, was spent in Brazil, after which he explored for several months in Chile. From there he went to Spain, then spent six months (May to September 1930) exploring in various colonies on the west coast of Africa. October found him in Sumatra, where he remained four months. Later in 1931 he returned to Brazil, then back to Sumatra in August 1932; Brazil again from 1933 to 1937, after which he spent a year and a half doing research chiefly on *Erythrina* at the New York Botanical Garden. From May to December 1939 he explored the basins of the Bopi and Mapiri rivers in Bolivia, since which time he has worked at the Garden.

The principal items of field exploration and studies were African mahoganies, various tropical Brazilian seeds yielding oil, high-yielding rubber trees, rotenone-yielding plants (*Lonchocarpus* spp.), plants used in preparation of "curare" (arrow-poison), *Cinchona,* and miscellaneous toxic and drug plants.

During these trips about 11,000 field numbers and more than 100,000 specimens were collected, besides approximately 4,000 authentic samples of woods for 10 to 15 sets each. The first set of all Oriental and South American herbarium specimens is in the Britton Herbarium of the New York Botanical Garden, and duplicate sets are in principal herbaria of the United States, Europe, and South America. The bulk of the wood collections are at the Field Museum of Natural History, Chicago, at the Smithsonian Institution in Washington, and at Syracuse University.

Papers published by Mr. Krukoff include the following:

The American species of Erythrina. Brittonia **3**: 205-337. 1939.

Preliminary notes on Asiatic-Polynesian species of Erythrina. Jour. Arn. Arbor. **22**: 225-233. 1939.

Studies of American Menispermaceae, with special reference to species used in preparation of arrow-poisons. Brittonia **3**: 1-74. 1938. (In collaboration with H. N. Moldenke).

Various papers on South American fish-poisons and arrow-poisons. (In collaboration with A. C. Smith and H. N. Moldenke).

Mr. Krukoff is a member of Phi Kappa Phi and Alpha Xi Sigma.

Notes, News, and Comment

Life Member. Mr. Charles O. Dexter of Sandwich, Mass., has been elected a Life Member of the New York Botanical Garden in recognition of his gift to the Garden of approximately 500 rhododendrons, azaleas, and kalmias of a value close to $3,000.

Board Member. Mr. Henry F. du Pont of 280 Park Avenue, New York, was elected on June 20 to the Board of Managers of the Botanical Garden in the class of 1943.

Collecting. Dr. H. A. Gleason returned to the Garden Aug. 10 after a two-months' collecting trip in the eastern and middle western states, bringing back a large number of specimens for the herbarium. Accompanied by John Dwyer, graduate student from Fordham University, he covered territory from New York to Virginia, west to the Mississippi and Missouri Rivers, and north to Minnesota and the Great Lakes region.

Japanese Beetles. Reports have reached the Garden repeatedly during the summer of Japanese beetles dying from feeding on geraniums. This toxicity is confirmed by the fact that thousands of beetles have been found dead on the flowers, leaves and in the vicinity of the planting of geraniums near the lower fountain in front of the Museum Building.

Plant Tumors. Prof. A. J. Riker of the University of Wisconsin, who is on a committee of scientists dealing with cancer problems and overgrowths in plants, came to the Garden Aug. 13 with Dr. P. W. Zimmerman of the Boyce Thompson Institute to consult with Dr. B. O. Dodge and members of Dr. Robbins' laboratory staff on further activities of the committee.

Fellowship. Thomas Laskaris, who has been working during the past year on diseases of delphinium, will continue his studies at the Garden for another year through a second scholarship granted by the American Delphinium Society. Mr. Laskaris began his work at the Garden last July under the direction of Dr. B. O. Dodge.

Groups. The Men's Garden Club, while having its annual convention in New York City, visited the New York Botanical Garden July 19. There were 80 in the group, and staff members conducted them around the rock garden, the annual and perennial borders, the main conservatories, and the display and experimental gardens of daylilies. A class from Fordham and a group from Cold Spring Harbor under the leadership of Dr. A. F. Blakeslee also visited the Garden during July.

Shade Tree Conference. Detroit will be the scene for the Sixteenth National Shade Tree Conference, which will take place Aug. 27-30. Headquarters will be at the Book-Cadillac Hotel. Among the addresses will be one on "Diseases of Shrubby Plants" by Dr. P. P. Pirone; "Raising the Standards of Tree Experts" by Frank Hanbury; "Wound Dressings" by Dr. Paul E. Tilford; and "Photography for Arborists" by Homer L. Jacobs and Dr. Forrest C. Strong. A plant clinic under the direction of ten of the country's leading scientists and tree workers will be a feature of the convention.

Returned. After nearly a year spent at the Botanical Garden in research on vegetative propagation, Dr. E. E. Naylor returned July 10 to the University of Missouri.

Field Trips. Dr. H. N. Moldenke recently led a field trip of the Torrey Botanical Club to Cheesequake State Park, N. J., as part of the series of trips conducted in conjunction with the New Jersey State Parks Department for the purpose of making a census of wild plants growing in the area of the park. On June 9 he conducted a joint trip of the Torrey Botanical Club with the Watchung Nature Club to Dock Watch Hollow and Chimney Rock, N. J.

Golf Greens. Dr. B. O. Dodge spoke before the Westchester Green Superintendents' Association in New Rochelle July 8 on factors involved in breeding grasses immune to diseases of turf, such as dollar-spot, brown-patch, pink-patch, smut, snow-mold, zonate eye-spot, and rust. The problem, he pointed out, involves the stability of the fungus the breeder is trying to control, because through mutation and hybridization new races are constantly being evolved among many parasitic fungi.

Visitors. Among the July visitors at the New York Botanical Garden were: C. Y. Wong of the Citrus Experiment Station, Lingnan University, Hong Kong, China; Julian Anna, Agricultural Experiment Station, Santiago de las Vegas, Cuba: Nell C. Horner, Missouri Botanical Garden; Charles Thom, U.S.D.A., Washington, D.C.; and Edward K. Balls, Kenilworth, England.

Cariceae. K. K. Mackenzie's "North American Cariceae" came off the press July 3, 1940.

THE NEW YORK BOTANICAL GARDEN

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures, covering the algae, fungi, mosses, ferns, and flowering plants. 1918. $3.50.

A Text-Book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Periodicals

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Memoirs of The New York Botanical Garden. A collection of scientific papers. Prices to members of the Garden: Vols. 1-6, $1.50 each; to others, $3. Vol. 7, $2.50 to members; to others, $5. *Contents*: Vol. 1, PER AXEL RYDBERG, An Annotated Catalogue of the Flora of Montana and the Yellowstone Park. Vol. 2, D. T. MACDOUGAL, The Influence of Light and Darkness upon Growth and Development. Vol. 3, ARTHUR HOLLICK and E. C. JEFFREY, Studies of Cretaceous Coniferous Remains from Kreischerville, N. Y. Vol. 4, C. STUART GAGER, Effects of the Rays of Radium on Plants. Vol. 5, NORMAN TAYLOR, Flora of the Vicinity of New York. Vol. 6, Twentieth Anniversary of The New York Botanical Garden. Vol. 7, N. L. GARDNER, New Myxophyceae from Porto Rico; A. B. STOUT, The Flower Behavior of Avocados; H. H. RUSBY, Plants Collected in the Amazon Valley; ARTHUR HOLLICK, The Flora of the Saint Eugene Silts.

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CAROL H. WOODWARD, Editor
September, 1940

HARDY ASTERS IN SEPTEMBER AT THE BOTANICAL GARDEN
Cover Photograph by Fleda Griffith

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INNOVATIONS IN EDUCATION

One of the characteristics of a public institution like the New York Botanical Garden is the special facilities that it maintains—such as the large herbarium for the use of scientists; the specialized reference library; and the extensive collections of living plants, some for study, the majority for public display.

To make these unique facilities available to adults who are genuinely interested in gardening and in plant life, courses of study are offered which are designed to meet educational needs for which a Botanical Garden is particularly equipped.

This attempt on the part of the New York Botanical Garden has resulted in the organization of courses of a nature to be found in few other institutions. In fact, practically every course announced in the new Educational Program has been originated here to meet specific needs.

Garden Appreciation, which will be repeated in 1941; Rock Garden Construction, offered this past summer; the Literature of Gardening, to be initiated this fall so far as is known, these subjects are now being taught nowhere else.

The Science Course for Professional Gardeners was an innovation in America when it was started in 1932. Since that time this form of training has been adopted in several other places. After experimenting for a number of years, the Botanical Garden in 1938 organized its Two-year Course in Practical Gardening, in which not only are lectures given, but the class is made to perform all the essential tasks in garden-making, under the eye of a critical professional gardener.

The course in Field Botany being given on Saturdays was organized at the special request of the New York Association of Biology Teachers, and thus is meeting another need.

While "short courses" of many types have taken place at other institutions, especially in connection with State Agricultural Experiment Stations, the Botanical Garden does not know of another in the fundamentals of actual gardening practice being taught by professional gardeners. A new three-day course built on this plan will be given early in May.

The attendance at courses already begun proves that they are meeting the public's desire for specialized instruction concerning plants, their culture, identification, structure and functioning, and their history, with an appreciation of their place in the scheme of life.

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Bizarre Trees And Other Strange Plants From Lower California

By Ira L. Wiggins
Dudley Herbarium
Stanford University

Some notes from a botanist's excursions into a mountainous desert area where the flora is unique.

A COPY of Nelson's paper on the natural resources of Lower California, which fell into Dr. Wiggins' hands in 1928, *was all that was needed to make this botanist, who calls himself a "confirmed desert rat," attempt a solution of some of the questions raised by descriptions of the vegetation. At the time he was studying the flora of San Diego County, and this seemed a favorable springboard from which to dive into the uncertainties of geographical distribution and specific limits in the flora of Lower California.*

The generous financial support of Mr. Ernest Dudley of Exeter, Calif., and of Mr. H. C. Dudley of Duluth, Minn., made possible a short trip in September 1929. *Numerous other expeditions have followed during the past ten years.*

Dr. Wiggins has already contributed one article to this Journal resulting from these trips into the peninsula—"Folklore and Fact of Medicinal Plants in Rural Mexico" in August 1939. *In this issue he describes some of the curious plants which contribute to the weirdness of much of the desert landscape. In a future number he will discuss some pines and other conifers, and shorter notes will appear from time to time.*
—C. H. W.

FOR more than half a century—from the time he made his first trip at the age of 22 until his last in 1910, a year before his death—Edward Palmer was one of the most indefatigable of scientific explorers in little known parts of North America, traveling constantly through the southwestern part of the continent, ever across new frontiers, always bringing back collections of plants and animals never before known to science. The new species of plants alone number more than a thousand; of these some 200 were appropriately named in his honor.

One which he discovered in 1887 was a remarkable *Brodiaea* with an initial vegetative growth consisting of an almost thread-like prostrate leaf

Desert vegetation near Punta Prieta. Gigantic trees of Idria columnaris and of Pachycereus Pringlei may be seen near the center. The major vegetative cover is formed by Lophocereus Schottii, Opuntia molesta, Machaerocereus gummosus, Pedilanthes macrocarpus, Yucca valida, Jatropha cinerea, and Franseria chenopodifolia.

—an inconspicuous start in life for a sturdy plant that develops a showy flower. He was collecting plants at that time in Baja California, spending some time at Mulegé and Los Angeles Bay. Sereno Watson reported on these collections[1] and described, among numerous other new species, this curious plant which he named *Brodiaea Palmeri.*

It grows chiefly in sandy soil and produces numerous bulblets, both around the base of the older bulb and as offshoots at the ends of filamentous rhizomes six or eight inches beneath the surface of the soil. These bulblets send up to the surface of the soil a solitary, terete, linear leaf 2 or 3 millimeters in diameter and from 5 to 30 centimeters long. This leaf lies prostrate or slightly arched on the sand, inconspicuous and appearing ineffectual. After an undetermined period of slow vegetative growth, during which the bulb increases considerably in size, the puny appearance of the one or two leaves suddenly gives way to a cluster of fleshy leaves, each of which may be as much as 3 centimeters wide and ten to fifteen times as long. At this stage the plant resembles a small leek, but lacks the alliaceous odor.

Somewhat after the spurt in vegetative growth begins, a stout scape bearing an umbel of buds within a papery sheath emerges from the central rosette. Each plant normally produces but one scape which may attain a height of nearly a meter and bears from 20 to more than 100

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[1] Watson, Sereno. Upon a Collection of Plants made by Dr. E. Palmer in 1887, . Proc. Am. Acad. **24**:36-82. 1889.

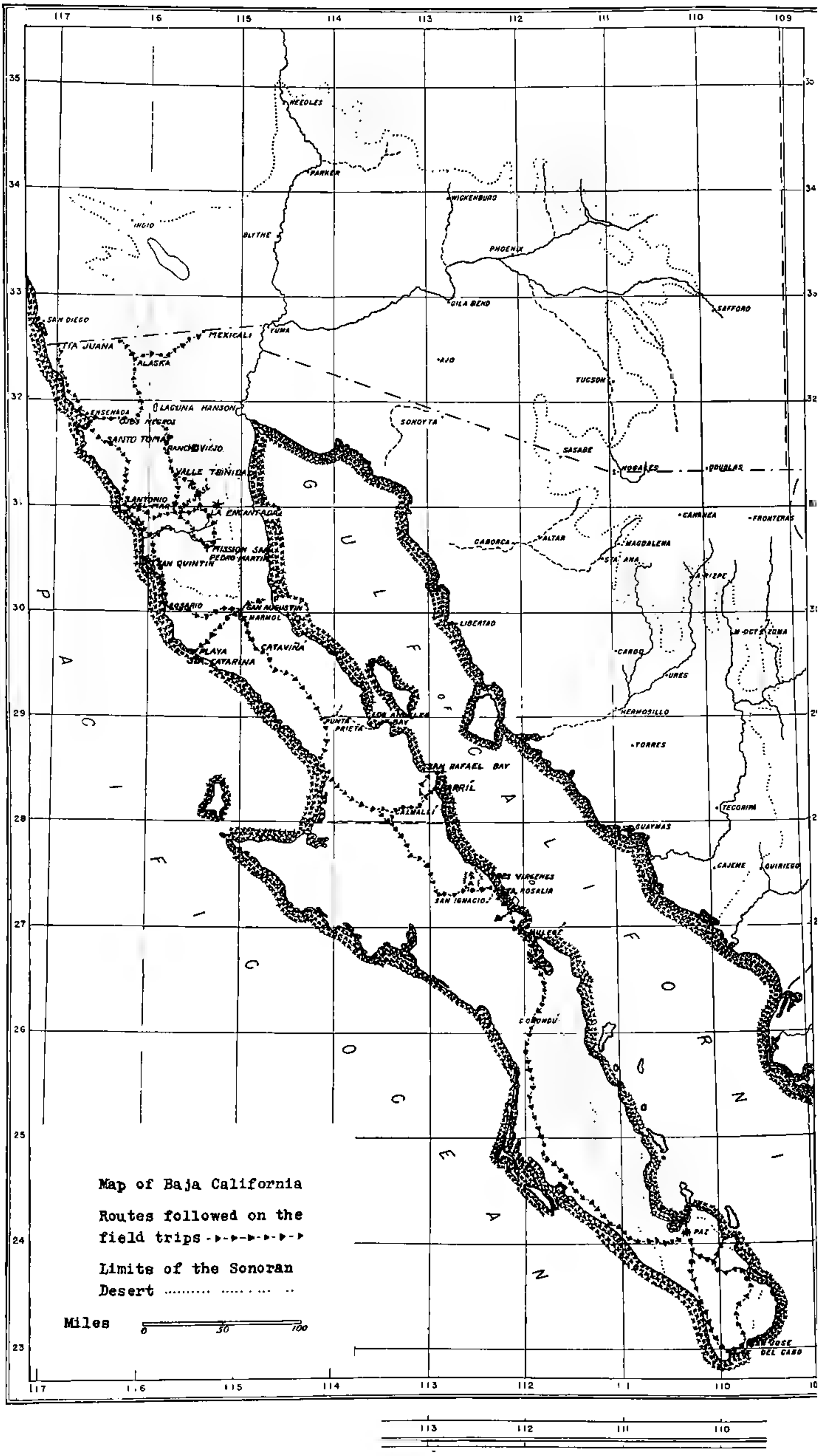
buds. The flowers are bright blue, funnel-shaped, about an inch long and only slightly narrower across the open throat. There is a prolonged succession of opening among the buds, so a single umbel may contain unopened buds, expanded flowers, dried blossoms and immature fruit all at the same time. The large umbels of bright blue flowers suggest a small *Agapanthus,* and if it can be introduced into our gardens *Brodiaea Palmeri* should prove popular. Twice bulbs dug during the flowering season have failed to grow in the San Francisco Bay Region, and seeds have not been collected yet.

In striking contrast to the comparative abundance of *Brodiaea Palmeri* in the dry, sandy desert, is the apparent absence of the genus *Lilium* in wet meadows and boggy canyon sides in the Sierra San Pedro Martír and Sierra Juarez. No trace of this genus was found in any of the numerous favorable habitats investigated in these two ranges during the field trip made in 1938. It is possible that heavy grazing by cattle and sheep has exterminated the true lilies in the region. At least three species of *Lilium* are growing in the Palomar, Cuyamaca, and Laguna Mountains of San Diego County, and it seems unlikely that these plants should have stopped short of the mountains just a few miles south.

Trees of the Peninsular Desert

Perhaps the bizarre appearance of *Idria columnaris,* "El Cirio" of the natives, has prompted writers on Baja California to exaggerate its im-

A "forest" of Yucca valida north of Punta Prieta. Opuntia prolifera is in the foreground; Jatropha cinerea behind it, and Fouquieria peninsularis at the right margin.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GUAYMAS
TECORIPA
CAJEME
QUIRIEGO
LAS VIRGENES
STA. ROSALIA
SAN IGNACIO
MULEGE
LORETO
PAZ
CABO DEL CABO
PACIFIC OCEAN
GULF OF CALIFORNIA
Map of Baja California
Routes followed on the field trips
Limits of the Sonoran Desert
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portance as a dominant feature of the flora. It is one of the more striking of the desert species, however, so the emphasis is excusable. For some time it has been known to extend from the vicinity of Rosario and El Marmol southward to the hills about Calmalli. In 1935 a Frenchman in the employ of the Boleo Company at Santa Rosalia showed us pictures of *Idria* growing on the northern slopes of Tres Virgenes, a series of three volcanic cones a few miles north of Santa Rosalia.

Another weirdly proportioned tree of Lower California is *Pachycormus discolor*, the Elephant-tree. The bark is from 1½ to 3 inches thick, chalky to sordid white externally, and contains ramifying ducts filled with a thick juice that is red in some trees, milky white in others. A cut or wound in the bark starts a copious flow of this thick juice, and when the exudate is red its blood-like appearance tends to increase the illusion that these trees are sluggish, earth-bound mammals. Goldman[2] accompanied his interesting account of this monotypic genus with two fine photographs of exceptionally swollen and twisted specimens. In the hills northeast of El Marmol most of the *Pachycormus* trees are quite erect, the main trunk often attaining a height of 10 to 15 feet, and the branches are less swollen. Masses of light pink flowers cover the tips of the naked branches in the spring, the blossoms appearing well before the leaves.

A Botanist's Field Trips South of the International Boundary

Expeditions which have been made into Lower California by Dr. Ira L. Wiggins are shown on the accompanying map. His initial trip took him into the northern part of the peninsula in September 1929. With the late Dr. John W. Gillespie he began collecting immediately after crossing the International Boundary at Tia Juana. "We traveled down the coast to Ensenada," he writes, "swung inland to Ojos Negros, across the Sierra Juarez about twenty miles north of Laguna Hanson, and re-entered the United States at Mexicali.

"The following February and March a second expedition took me about three hundred miles south of the border to a rancherita named Cataviñá, and westward from San Augustin to Playa Santa Catarina. A third trip in September 1930 netted a number of new species from the central part of the Sierra San Pedro Martír.* Another took Professor James I. McMurphy and me the length of the peninsula during the spring of 1931. In February, 1935, a fifth trip took me as far south as San Bruno, a rancho a few miles south of Santa Rosalia, and during September and October 1938 Dr. Albert M. Vollmer of San Francisco generously invited me to accompany him on a pack trip that took us into the southern Sierra San Pedro Martír, northward along the high meadows of the range, across the Valle de la Trínidad, and into the Sierra Juarez as far as El Ceradero, a sawmill about ten miles south of Laguna Hanson.

"Collections were made and field observations recorded during all of these field trips. Some of the collections have already been distributed to various herbaria in the United States and Europe; others are still being studied."

---

[2] Goldman, Edward A. Plant Records of an Expedition to Lower California. Contr. U. S. Nat. Herb. **16**:309-371. 1916.

* Wiggins, Ira L. New Plants from Baja California. Contr. Dudley Herb. **1**: 161-178. *pl. 11-17*. 1933.

Idria columnaris showing how the branching varies. The specimen on the right was photographed near Cataviñá.

A Parasitic Plant

A remarkable species of *Cuscuta, C. Veatchii*, is associated with *Pachycormus* throughout its range. The seeds of the parasite remain in the capsules embedded in tangles of dry filaments from the previous year's growth, and germinate while thus suspended on the host tree. The minute *Cuscuta* seedlings must enter the tissue of the host immediately or die. They appear to attack the young leaves soon after the latter make their appearance, though a few germlings were found forming haustorial knobs where they came in contact with young stems. On leaves the point of entrance of the parasite may be either on the petiole, where the haustoria apply themselves directly to the phloem of the vascular bundle, or less frequently on the blade. In the latter case the haustoria attack any of the photosynthetic cells and do not seem to go as directly to the vascular

bundles. Brandegee, in a paragraph following his description of *Cuscuta Veatchii,* shrewdly guessed that the seeds germinated on the host tree and not on the ground, recording his surmise in the following words: "As the parasite was often 6—8 feet from the ground, with no intermediate growth, it did not seem that it had germinated in the usual way on the earth."[3] The manner in which the germlings emerge from the capsule and immediately parasitize the host was investigated in the field near Los Angeles Bay in the spring of 1935.

Sonoran Associates

Fouquieria splendens is abundant from the Colorado Desert and adjacent Arizona southward along the Gulf of California to the central part of the peninsula of Lower California. About five miles north of Punta Prieta it begins to disappear and *F. peninsularis* takes its place. There is an over-

[3] Brandegee, Townshend Stith. Plants from Baja California. Proc. Calif. Acad. Sci. ser. 2. **2**:189. 1889.

A heavy stand of Pachycormus Veatchii on a basaltic hillside north of Punta Prieta. Machaerocereus gummosus is just behind the bush in the center foreground; Pachycormus at the right margin.

lap of the ranges of the two species for a distance of 10 or 15 miles, but the northern species is rare south of Punta Prieta. At about this same point *Jatropha cinerea* becomes an important element in the flora, *Sibara laxa*, a delicate Crucifer, reaches its northern limit, splendid specimens of *Pachycereus Pringlei* occur, and *Yucca valida* forms one of the most extensive and heavy stands of this species on the peninsula.

Fragrance in the Desert

Three more plants call for mention. Most plants that attract one's attention in the desert do so through the medium of sight. But these three often lead one 50 to 75 yards, to a spot at first unseen, by their fragrance alone. *Lyrocarpa Coulteri* and *Dithyrea californica* are Crucifers. The former is a sprawling, scrambling perennial that grows entangled among the branches of desert shrubs, and bears brownish, inconspicuous flowers. *Dithyrea* grows in sandy soil away from protecting shrubs, bears racemes of showy white flowers slightly less fragrant than those of *Lyrocarpa*. The third member of this fragrant trio is the Sand Verbena, *Abronia gracilis*. Its odor is less penetrating than that of the Crucifers, but in the early spring following a light shower its delightful perfume epitomizes the essence of desert bloom.

To a hopelessly confirmed desert rat there are dozens of other plants occupying the regions of high temperatures, rainless summers and immense spaciousness that hold intense interest for him. But this sample may serve to give some idea of the magnitude of the problems facing the plant geographer entering the southwestern deserts; to show that the term "desert" need not signify miles of wind-swept waste; and to hint at the variety of plant life occupying habitats from sea level to an altitude of about 10,000 feet at the summit of La Providéncia in the Sierra San Pedro Martír.

Growing Alpines In Sphagnum With Nutrient Solutions

By C. Coleman Berwick

DO YOU REMEMBER when you found that lovely little alpine plant growing wild in its native state, and how you were unable to resist the temptation to bring it home for your rock garden? Perhaps you were struck with the character of the soil in which it was growing, and wondered how it could find nourishment enough to sustain itself in such poor soil. Alpines are truly remarkable plants and a little extra plant food in their soil goes a long way. Naturally, one wants his alpines to be as nature intended them——small, compact, happy little dwellers of the sunny

mountain tops. As a rule, the only vegetable matter in the soil of these high ledges and benches is the dried and decayed parts of plants living at the same level or blown there from below by storms that sweep up and over the mountain top. Somehow these little plants seem to find food enough to live happily in a soil which would not support many other types of plants. One realizes that from this poor-looking stuff must come all the chemical elements necessary for the plant to continue its normal physiological functions.

It is not a new idea to grow alpines in sphagnum and many people have been doing this for years. The alpines seem to get along all right, but somehow they are not as happy as when they grow in their native habitat. The horticulturist who manages to flower such plants considers it to be quite an achievement, and often boasts of his success, as well he might. After trying for a long time to duplicate natural growing conditions, we decided to try the sphagnum idea and to supplement the nourishment in the sphagnum with a controlled amount of chemicals. So we gradually evolved a procedure which gave us just what we were looking for. A brief description of our method of growing alpines in sphagnum is offered in the hope that other venturesome souls will have the pleasure of growing these plants better than they have heretofore succeeded in doing. We trust that our small effort will prove helpful to these kindred spirits who delight in these gems of the garden.

The Plants to Choose

The first essential is of course the plant, and we strongly advise against starting with adult specimens. The grower should try to get young plants, for these seem better able to adapt themselves to this form of culture than those that have passed beyond their first vigorous flowering. In getting plants from a grower, immature ones, if at all available, should be insisted upon. But it is even better to start at the beginning and raise one's own plants. As a result the gardener is better able to set the stage for the future development of the alpines he intends to work with. Therefore let us consider some of the more important factors that limit our experiment.

In the first place, we found the hydrogen ion concentration of sphagnum to be between 5.5 and 6.0.[1] This must be taken into consideration when the plants are selected to be grown in sphagnum. It is almost useless to try to establish a plant demanding an alkaline soil in sphagnum with its attending acid reaction, although it is really surprising the large number of plants that seem to get along very satisfactorily with their roots in a soil with relatively high acidity. This group of facultative acid tolerant plants

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[1]Nitrazene Indicator (sodium dinitrophenyl-azonaphthol disulphonate) is available in either liquid form or as treated paper strips. Color changes can be simply compared with a color chart. The whole test kit is inexpensive and quite efficient.

is a great deal larger than is generally supposed, and additional trials will no doubt show that the group is larger still. However, a certain amount of care must be exercised in choosing plants that normally prefer or demand or tolerate an acid soil to be used for the experiment. Our best success was naturally obtained with those plants that are accustomed to a fairly high degree of soil acidity, and our most outstanding failures were met with in those plants that were definitely alkaline-loving types.

Starting From Seed

The plants we desired were raised from seed in the usual manner and transplanted into pots in a soil mixture which contained a bit more than the usual amount of finely sifted peat. We were particular that the soil had a definite acid reaction (pH 5.4—5.6). When these plants were about half-grown in the middle of October, they were tipped out of their pots and all of the soil was carefully removed by gently washing the roots in a basin of water. Under no circumstances should the root system be allowed to dry off; furthermore, when washing the soil from the roots, we found it was wise to select a day when the atmospheric humidity was high and the air was still. This caused less shock and disturbance to the plant. Extra care taken at this stage of the experiment amply compensated us in lack of damage and less set-back.

Our plants were next carefully potted in sphagnum, attention being given to tucking the sphagnum gently between and around the delicate roots, using a pair of forceps to handle the sphagnum fibres. This sphagnum had been soaked over night beforehand and just before using it, all excess water was squeezed out, leaving the fibre soft and spongy but damp. The sphagnum was shredded or pulled apart so as to loosen the individual strands, which could then be easily handled. We tucked the fibres in first about the roots and as the pot began to fill with sphagnum, we gradually forced more and more fibres into the pot at its outer edge, always forcing it toward the center of the pot, using a pointed stick or screw driver for the purpose. When the potting job was complete the sphagnum was wedged in so firmly as to permit the whole pot to be lifted when picked up by the top of the plant.

Pots and Potting Methods

The pot itself must be given special consideration. If an orchid pot having several drainage holes is available it should be used, otherwise it is necessary to provide extra drainage facilities. It has been our practice to break out the drainage hole of the pot with a small hammer until an opening is formed to include about half of the diameter of the pot bottom. This is then covered inside with a piece of broken crock and the pot filled with bits of sherd for one-third its depth. One can use a much smaller pot

for the plants than the usual size because of the different type of root development resulting from the feeding with nutrient solutions.

After potting, each plant is placed under the bench in the shade and cool air for a few days to give the roots a chance to get more quickly established in the sphagnum. They are gradually brought out into the light as they become better accustomed to their new living conditions. Two weeks after potting should find the roots growing actively in the sphagnum. The plant is then permitted to spend the winter getting better established in its new environment. Water should be withheld as winter approaches and the plant's more or less dormant period arrives.

One can easily understand that there is not a great deal of fertilizer in sphagnum and plants growing in it must struggle for their very existence. A certain amount of the sphagnum does break down and become available to the plant but this amount is not great.

Chemical Solutions

It occurred to us to add to the sphagnum in which alpines were planted a more or less complete fertilizer. This was done, not for the purpose of making "bigger and better" plants, but to try to supply as much as possible those chemicals so necessary to the plant's economy. Various substances were tried as fertilizers but discarded because of some objectionable feature. Finally we tried Hoagland's solution of salts[2] as a routine fertilizer for the plants in sphagnum. The use of these solutions has now become fairly well understood and, in our experience, relatively simple in practical application. We believe that any of the later formulae of Hoagland's solution would be satisfactory providing the acidity is corrected to pH 5.5 or 5.6. We found a modification of the formula as developed by Hoagland and Arnon to suit our purpose very well. This solution is made up as follows:

Calcium Nitrate	$Ca(NO_3)_2 \cdot 4\,H_2O$	1.18 gm.
Potassium Nitrate	KNO_3	.50 gm.
Magnesium Sulphate	$MgSO_4 \cdot 7\,H_2O$	.49 gm.
Potassium Dihydrogen Phosphate	KH_2PO_4	.13 gm.
Distilled Water to make		1000.00 cc.

To this solution, which is a stock solution and which may be made up in larger quantities, we add to each 1000 cc. before using, the following:

Ferric Chloride	$FeCl_3$ (0.5% sol.)	1.00 cc.
Boric Acid	H_3BO_3 (sat. sol.)	2.00 cc.
Manganese Sulphate	$MnSO_4 \cdot 4\,H_2O$ (0.25% sol.)	0.25 cc.
Zinc Sulphate	$ZnSO_4 \cdot 7\,H_2O$ (0.25% sol.)	10 drops
Copper Sulphate	$CuSO_4 \cdot 5\,H_2O$ (0.25% sol.)	5 drops

[2]Described by D. R. Hoagland and D. I. Arnon in the Water Culture Method of Growing Plants without Soil. Univ. of Calif. College of Agriculture Circular 347, Dec. 1938.

Various systems may be employed in applying the chemical solution to the plants but we found that it was better to immerse the entire pot in a jar of the nutrient solution, allowing the sphagnum to absorb all of the solution possible. The pot is then set aside to drain and the solution that drains away is not used again, but is allowed to escape. It is not advisable to try to economize and use these solutions again—there are certain losses in the formula after soaking the pot in the solution and the chemical balance is upset, rendering it unfavorable to the plant. Needless to say. these solutions are made up very cheaply and one can easily afford to be generous with them.

When to Water

It is rather difficult to set down any definite period or frequency for feeding with nutrient solutions, there are so many factors involved Humidity, light, temperature, and wind all influence the growing conditions of the plants and alter any stereotyped rules that one tries to set down for another's guidance. We usually begin to feed our plants when the first spring growth starts, once about every three weeks at first, gradually increasing in frequency as growth proceeds. At the height of growth activity the plant is fed at 10- to 14-day intervals, and this is continued until the flowers begin to open. As flowering begins, we gradually lengthen the interval between feedings. After flowering is over, the modified Hoagland's solution is entirely withheld, and the plant is allowed a chance to settle down for the winter dormant or resting period.

If it is necessary to water the plants because of the drying out of the sphagnum, we use ordinary pure water between feedings of the modified Hoagland's solution. It is our practice to water only after the sphagnum is quite dry. When we say "dry" we mean relatively dry, and here again common sense must enter into the management of the experiment. As a routine procedure, however, we came to the conclusion that it was better to under-water than to water too often. Plants kept on the dry side look more like those growing in their native state.

Results Using Solutions

Plants established in sphagnum and nourished on Hoagland's solution look happier, and they duplicate more closely their natural appearance than when planted in soil mixtures, even though the soil has been specially prepared for the individual plant. Flowering is a bit more prolific and the flowers are a trifle larger than when they bloom under ordinary culture. We soon learned that there was a greater tendency for these plants to set seed than those growing in soil.

It has not been our experience to have these plants grow beyond their usual size because of the feeding if, when the feeding is done, one bears

in mind that the horticulturist is trying to simulate natural native processes, using a very delicately balanced medium for the purpose. He must remember that the artificial conditions controlling or limiting his handling of the plants must be counter-affected by conditions more favorable than the plant is normally accustomed to enjoy.

The plants seem to fill out more and to branch more frequently, both of which factors are desirable and are encouraged. An occasional pinching back of the growing tip in the early season helps to keep the plant settled down, and more attractive. The chemicals in the nutrient solutions do impart a better color to the foliage of the plants, giving them a healthier appearance and, what is more important, favoring greater carbohydrate synthesis. For this reason these plants are a great deal more hardy than when raised under ordinary cultural methods. They withstand the winter cold and there is less tendency to frost damage, provided the feedings are stopped soon enough.

In conclusion, we may add that this method of growing alpines applies to pot-grown plants only. We used our surplus Hoagland's solution and the portion drained from potted plants as a liquid manure for the alpine garden outdoors. These plants seem a trifle more happy than they formerly did but the difference was not sufficient to warrant the effort in supplying this extra nourishment as a regular procedure. There certainly is a definite place, however, for this particular practice in growing alpines, if one is trying to raise and maintain specimen plants in small pots. There is no practical application of the method in ordinary garden conditions. If the horticulturist is raising pot plants and maintaining them as such, although placing them in a sand or gravel bed, the whole routine is definitely worth while.

The writer would be very glad to learn the experience of others who dare to be different and try this interesting method of culture for alpine plants.

A House-Plant Which Propagates Itself

By E. J. Alexander

"PICKABACK" the New York florists call it, and indeed the new plants do ride "piggy-back" on the old leaves of *Tolmiea Menziesii*, a species which is enjoying increasing popularity as a house-plant, a purpose for which it is eminently suited. Some growers call it "Youth-on-Age." It is quite capable of enduring the dry air conditions of living-rooms, to say nothing of dust and other air impurities, asking only to be well-watered and

kept out of strong sunlight. That these would be its requirements is not surprising, for it is native along mountain streams and in shady woods of the Pacific Coast region from northern California to southern Alaska, one of the heaviest rainfall areas of North America.

Tolmiea was given its generic name to honor Dr. William Fraser Tolmie, medical officer of the Hudson's Bay Co. at Fort Vancouver, Puget Sound, in 1832 and after. Dr. Tolmie was also a botanical collector, and one whose name is always associated with the flora of the northwest coast of North America. Tolmiea receives its specific name *Menziesii* in honor of the man who first collected it, Dr. Archibald Menzies, physician, surgeon, and one of the foremost botanists of his day, who accompanied Captain Vancouver on the voyage of the "Discovery" in the 1790's.

Dr. Menzies first collected the plant on Banks Island, off the coast of British Columbia. It was first called *Tiarella Menziesii,* then the name was changed to *Heuchera Menziesii,* then to *Leptaxis Menziesii,* and finally to *Tolmiea Menziesii.* Since it represents a distinct genus, the name *Leptaxis*

An easy-to-grow, self-propagating house plant, Tolmiea Menziesii, otherwise known as "Pickaback." The plant below was photographed through the courtesy of the St. James Flower Shop on Bedford Park Boulevard, near the Botanical Garden, where it is on display.

(This and the two accompanying photographs were made by Charles Weiss, through the co-operation of the Works Projects Administration.)

A portion of the right-hand side of the plant illustrated on the preceding page, showing several mature leaves with young plants arising from the juncture of the blade with the petiole.

A young plant potted up, with the parent leaf still attached. Its own roots are not formed until after the new plant is set in soil.

is its oldest and rightful generic name, but the "powers" who made the International Rules of Botany have decreed that its younger name of *Tolmica* shall be its legal name, a not altogether unpraiseworthy decision, as it associates the name of Tolmie with a plant from the region where his name is best associated.

One of the most interesting things about the plant is its method of vegetative propagation. An adventitious bud is present at the junction of the leaf-stem and the leaf-blade, and from this bud a new plant grows even while the leaf is still attached and in full health. Under wild conditions the bud rarely develops into a plant until the leaf has decayed or become separated from the parent plant. The plant, however, flowers and sets seed freely in the wild, but under cultivated conditions it rarely flowers and so the adventitious buds develop into plants while the leaves are still attached. A plant in normal health is usually to be seen with young plants on many of its mature leaves. These young plants, however, will not form roots unless the leaf on which they are present is detached and placed on the soil under moist conditions. The flowers are borne in a racemé upon the terminal portion of a leafy-bracted stem eighteen inches to two feet tall. They are tubular in shape, nodding, purplish and green in color, and most unattractive. In the wild young plants also arise from the axils of the leaves on the flower-stem.

Three-Day Short Course In Practical Gardening Announced In New Edition Of Educational Program

THE second edition of the Educational Program, which is being issued this month, contains an announcement of a new type of course which is to be given at the New York Botanical Garden next spring. It is to be a Three-day Short Course in Practical Gardening, with lectures, demonstrations, and practice under the supervision of six prominent professional gardeners. It will take place May 5, 6, and 7, the class assembling from 10 a.m. to noon and from 1:30 to 4:45 p.m.

The instructors will be J. H. Beale, Superintendent of the Arboretum, Boyce Thompson Institute; George H. Gillies, Head Gardener on the Marshall Field estate at Huntington, L. I.; James S. Jack, Head Gardener for Mrs. Mark S. Matthews at Rye, N. Y.; Thomas Little, Superintendent for Col. Robert H. Montgomery at Cos Cob, Conn.; Robert Scott, Head Gardener on the estate of Mrs. W. A. M. Burden at Mt. Kisco; and John Watts, Head Gardener on the H. E. Manville estate at Pleasantville.

The description of the three days of concentrated study and gardening practice as it appears in the Educational Program reads:

> The course will deal with the fundamental principles of gardening, and each student will be required to work at each important gardening task taught until familiarity with the method is acquired. If weather, during any appreciable part of the time, prevents effective outdoor work, the class will be permitted to remain for an extra day to receive instruction from members of the gardening staff at the New York Botanical Garden. Subjects covered in the three days of work include such practical aspects of outdoor gardening as Soil Preparation, Pruning, Vegetative Propagation, Seed-sowing, Lawn-making, and Planting and Transplanting. Enrollment strictly limited to 50 students. *Registration must be made by April* 15.

The fee for the course will be $15. Annual members of the Botanical Garden, if they are taking no other courses during the same year, will receive a credit of $10, the amount of their membership fee, in registering for this course.

In courses to be given at the Garden this fall, the following subjects will be offered:

Field Botany, opening Saturday, Sept. 14, at 1 p.m. in the Museum Building, Dr. W. H. Camp in charge of course. A spring term will start in February.

Cultivation of Trees and Shrubs, opening Thursday, Sept. 26, at 7:45 p.m. in the Museum Building, Mr. P. J. van Melle, instructor. This is one of the six subjects in the Two-year Course in Practical Gardening, for which a certificate is offered. Cultivation of Greenhouse Plants under Mr. Joseph W. Tansey will be given for the winter term.

Plant Pests and Diseases, starting Monday evening, Oct. 7, in the Museum Building, Dr. B. O. Dodge, instructor.

Soils and Fertilizers, the same evening, Dr. Frederick W. Kavanagh, instructor. These two subjects will comprise the current autumn term of the Two-year Science Course for Professional Gardeners. During the winter, instruction will be given in Plant Breeding under Dr. A. B. Stout and in Economic Botany under G. L. Wittrock. Professional gardeners desiring to register for any subject in the Science Course must meet certain qualifications, which will be passed on by a committee meeting at 7 p.m. on the opening night. The first class begins at 7:45 p.m.; the second at 8:50.

Beginning Mar. 31, Dr. H. W. Rickett's course in Garden Appreciation will be repeated.

More complete information on the courses is contained in the Educational Program, copies of which will be sent free to inquirers upon request.

Autumn Lectures At The Garden

ON Sept. 14 the autumn series of free Saturday afternoon lectures will be opened at the New York Botanical Garden and will continue through Dec. 14. They will be given each Saturday from 3 to 4 p.m. in the Museum Building. In the library there will be each week an exhibit of books relating to the subject of the weekly lecture. Colored slides will be used to illustrate most of the talks, the subjects of which are as follows:

Sept. 14 ***Flowers and Fruits of Autumn***
E. J. Alexander, Assistant Curator

Sept. 21 ***Success with Azaleas and Rhododendrons***
P. M. Koster, Nurseryman

Sept. 28 ***Lighting for Flower Production***
John M. Arthur, Boyce Thompson Institute

Oct. 5 ***Autumn Planting for Spring Bloom***
Ethel Anson S. Peckham, Honorary Curator, Iris & Narcissus

Oct. 12 ***Some Seaweeds and Their Companions***
H. Beaman Douglass, M.D., Lecturer

Oct. 19 ***Designing the Small Garden***
Nelson M. Wells, President, City Gardens Club

Oct. 26 ***Gardens of Antiquity***
H. W. Rickett, Assistant Bibliographer

Nov. 2 ***Marvels in Plant Adaptation***
H. N. Moldenke, Associate Curator

Nov. 9 ***How Garden Pests Spend the Winter***
B. O. Dodge, Plant Pathologist

Nov. 16 ***A Tour of the Conservatories***
T. H. Everett, Horticulturist

Nov. 23 ***Grapes and Their History***
A. B. Stout, Curator of Education and Laboratories

Nov. 30 ***Spring in the Asia Minor Islands***
Prof. & Mrs. Clarence H. Young

Dec. 7 ***Garden Books for Christmas Gifts***
Elizabeth C. Hall, Librarian

Dec. 14 ***Plants and the Course of Civilization***
W. H. Camp, Assistant Curator

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

By Airplane to a Stone-Age Island

NEW GUINEA EXPEDITION. Richard Archbold and A. L. Rand. 206 pages, illustrated and indexed. Robert M. McBride & Co., New York, 1940. $3.50.

Vastly different is this tale of exploration from most others. In the story of the Second Archbold Expedition, working in the almost unknown Fly River country of southern New Guinea, melodrama is so absent from the writing that one is almost persuaded that nothing exciting happened on the trip. Yet the books remains eminently readable.

It is a straightforward, almost day-by-day account of the party's doings that will delight anyone interested in exploration, though leaving much to be desired by the scientist, especially the botanist. Botanical observations are scattered and general. The authors being zoologists, this is, perhaps, to be expected, though the botanical results of the expedition are of tremendous importance.

Treated as drama, though never as melodrama, is the continual contact between one of the most modern and highly equipped of all expeditions, with airplane transportation and parachute landings, and the Stone Age Papuans, some of whom had never before seen a white man. All relations between the party and the natives will be to the everlasting credit of the expedition. The climax of the trip, the news of the loss of the airplane, would in most such books have been the occasion for at least a chapter on the emotions of the party. In this account two short paragraphs mention the consequences and disappointment. In a third, plans are being made to go down the river on rafts.

Excellent maps scattered through the book keep the reader oriented in the vast and practically unknown island of New Guinea, so that even the confirmed geography addict materially increases his familiarity with the face of the earth. Much of the human and scenic interest of the book lies in the abundant photographs. Most of them are good; one or two are masterpieces. It is a pity that the touching-up seems to have been done by a newspaper engraver. The book is interesting and the print is large. It is to be hoped that the authors will give us the story of their third expedition in a like manner.

F. R. FOSBERG,
Bureau of Plant Industry,
United States Department of Agriculture.

But Where Are the Best of the Shrubs?

THE HOME BOOK OF TREES AND SHRUBS. J. J. Levison. 424 pages, illustrated and indexed. Simon & Schuster, New York. 1940. $5.

One evening toward the end of May, I picked up this new book titled "The Home Book of Trees and Shrubs." It is voluminous, of more than 400 pages, excellent paper, clear legible print, and with numerous first-class illustrations. On the back flap we read that the author wrote one of the outstanding texts in this field, published 20 years ago.

With anticipation I turned over the pages in order to read remarks on shrubs I had admired that same evening in the garden — shrubs like the Pearl-bush (*Exochorda*) in various species displaying graceful racemes of large white flowers; shrubs like the Asiatic Sweetleaf (*Symplocos paniculata*) and its wreaths of white blossom that are a promise of bright blue fruits in the fall, and so popular for arrangements; or shrubs like the American Witch Alder (*Fothergilla*) that lately delighted us with its many spikes of white inflorescence.

But these, indeed many fine genera, are not mentioned. Others get scant notice. The Barberry for instance, is represented by only two of its almost 200 species—*B. Thunbergii* and B. *verruculosa*. In some public places I believe the former is now banned.

Not only in selection but in description of material is the book disappointing, and in saying this it is necessary to point to some of the errors. At page 77 we find in a chapter dealing with the best trees and shrubs: "Japanese Kerria or Globe-flower (*Kerria japonica*)—double yellow flowers; medium shrub. This shrub also has varieties with single flowers in yellow or white." According to all others who have written textbooks on this subject the type plant of *K. japonica* has single yellow flowers, while there is a double-flowered variety known as *pleniflora;* nor is there a white-flowered Kerria. Obviously the author confuses the genus with *Rhodotypos.* On page 78 we find: "Chinese Wisteria (*Wistaria sinensis*) blue, pink, white, and yellow flowers; vine." Nowhere else have we read of a yellow-flowered Wistaria! In another place I find the variety Dorothy Perkins listed as one of the two best Rambler Roses. It is difficult to convince oneself that today any rosarian would agree.

Chapters on Pruning, Repairs and Protection, and on How to Control Insects and Diseases cover the subjects well, and only to read them shows that the writer has an intimacy with the work.

The book, however, does not confine itself to trees and shrubs. Some other branches of gardening are given each a chapter; but "Flower Borders for the Home Owner" which is given a chapter to itself is much too comprehensive a subject to be dealt with in this cursory fashion. A good chapter deals exhaustively with Lawns, although somewhere else in the book it is stated that a lawn, prior to seeding, was made by putting 10 inches of good garden loam on top of a layer of old manure. This looks like burying much of the manure.

The owner of home grounds is told that skilled workmen are necessary for the rock garden; and, in caring for cavities in trees, he is cautioned to learn the fundamental principles of the work, so that he can recognize the expert from the "mere mechanic." To the owner who can still afford the services of a good professional gardener—and some are to be found, while young men are being trained—such information is hardly necessary It must however, be disturbing and not very articulate to the small home owner who turns to gardening as a diversion or hobby.

This reviewer cannot conscientiously recommend the book as a valuable contribution to the literature of trees and shrubs.

JAMES G. ESSON,
Superintendent, Estate of Mrs. Roswell Eldridge.
Great Neck, N. Y.

Gardening in War-time Britain

GARDENS AND GARDENING. Edited by F. A. Mercer and C. G. Holme. 112 pages, illustrated and indexed. The Studio Limited, London (Studio Publications, Inc., New York). 1940. $4.50.

Description of the Italian Riviera garden, La Mortola, and of the Spanish garden, La Granja, built for King Philip V, are two of the leading illustrated features of the 1940 edition of Gardens and Gardening. The photographs of some of the unusual plants in these places, names of which are given in the index, have exceptional clarity of outline and detail.

In a chapter on Gardening in War-time, Roy Hay deals with the culture of vegetables, but at the same time begs his readers not to relinquish the much-needed beauty that a garden can provide.

"In the garden," he writes, " . . . we have a powerful antidote for nervous strain." In the foreword the editors also beg the people to continue gardening and recommend the purchase of at least a few novelties from the nurseryman to ease the strain of war-time readjustment.

The Gardener's Calendar, by Mr. Holme, while of little use outside the British Isles, is worth more than a glance for the amusing way it has been illustrated by Sydney R. Jones.

Among the American gardens pictured in this volume are those of W. S. Carpenter, Philadelphia; Mrs. Holden McGinley, Milton, Mass.; Mr. and Mrs. John Henry Hammond, Mt. Kisco, N. Y.; Dr. A. R. L. Dohme, Mountain Lake, Fla.; Mrs. Harrison Williams, Palm Beach; the late Louise Beebe Wilder, Bronxville, N. Y.; Mrs. Clayton E. Freeman, Glen Ridge, N. Y.; Mr. and Mrs. Oliver B. Capen, Bedford, N. Y.; Walter S. Carpenter, Jr., Wilmington, Del.; Mrs. Washington Roebling, Charleston, S. C.; Mr. and Mrs. Carll Tucker, Mt. Kisco, N. Y.; Gerard B. Lambert, Princeton, N. J.; Henry A. Hoffman, Bannington, R. I.; Mr. and Mrs. William J. Knapp, Rye, N. Y.; Cesare Protto, Wilmington, Del.; the Misses Van Winkle, Bedford,

N. Y.; Mrs. Christian de Waal, Lexington, Ky.; the late Samuel Untermyer, Yonkers, N. Y.; Mr. and Mrs. Richard Webber, Grosse Pointe Farms, Mich.; Mrs. George M. Laughlin, Mountain Lake, Fla.; Mrs. William T. Galey, Overbrook, Pa.; and Harold S. Vanderbilt, Palm Beach, Fla.

CAROL H. WOODWARD.

For Greater Enjoyment Of the Desert

DESERT WILD FLOWERS. Edmund C. Jaeger. 322 pages, illustrated and indexed. Stanford University Press, California. 1940. $3.50.

Some of the distinctive features of this book, written more for those who have the amateur's love of living plants than for the professional botanist, are the numerous outline drawings which illustrate most of the 764 plants treated; ecological notes obtainable only through many months' sojourn in the deserts; natural history comments on the birds, reptiles, and insects that inhabit or are associated with the plants; ethno-botanical information gleaned from numerous contacts with the Indians of the southwestern deserts; brief explanations of the meanings of the generic and specific names used; short biographical sketches that at least give the identity of persons for whom genera or species of plants growing in the deserts of southern California have been named; and the list of such persons with references to the species under which the sketches are given.

The drawings, made mostly from living material, in general depict accurately the diagnostic characters of the plants, though some of them are too small when reproduced to permit of accurate shading with colored pencils as suggested by the author. In some instances the inclusion of a detailed drawing on higher magnification would have given a better clue to the identity of the plants than do the reduced habit sketches. For example, drawings of the involucres and flowers of the species of *Eriogonum* and *Chorizanthe*, and of the bracts of the fruits of *Atriplex*, or of the spine clusters of some of the Cactaceae would have been more helpful than some illustrations used to determine plants within these groups. But most of the drawings are well chosen and beautifully executed.

Typographically the book is of high quality, the pages being clear and easily read. The reproduction of the photographs is below the standard usually required for scientific books, for the lithoprinted reproductions are fuzzy and lack the sharpness necessary to bring out the full beauty of the desert landscapes and habitat groups.

The lack of keys to families, genera, and species may seem, to the professional botanist, to detract from the value of the book. But since the non-professional plant lover will often match his plant with an illustration rather than laboriously run it through a key, the line drawings themselves serve as admirable "keys." The descriptions are brief and contain few technical terms—another point that recommends the book to the amateur. In spite of their brevity, however, the descriptions stress the characters most evident in the living plant, and since the author is trying to emphasize the desirability of studying the desert flora in the desert, these diagnostic characters mean more than many lines of technical descriptions—at least to the layman who wishes only to enjoy the deserts and their plants.

Altogether, the book shows careful selection of material, an intimate and accurate knowledge of the flora and fauna of the Colorado and Mohave Deserts, and a remarkable facility with a drawing pen. It is readable, and possesses the advantage of being equally interesting when begun at the beginning or dipped into at any page between its attractive covers.

IRA L. WIGGINS,
Stanford University.

Through the Majestic South

CAROLINA GARDENS. E. T. H. Shaffer. 326 pages, 56 illustrations, indexed. University of North Carolina Press, 1939. $3.50.

Briefly introduced by Du Bose Hayward, the author proceeds to trace the development of Carolina gardens from their beginning in the seventeenth century, through the plantation days of rice, indigo and cotton growing, through war-torn days and days of economic stress, to the present time.

Rambling across this southern country Mr. Schaffer pushes aside molesting forest growth to show us the decadent majesty of old deserted mansions, proud in design. With the keen perception of

an artist he describes the avenues of live oak hung with Spanish moss and the intimate gardens for which plants from Europe and Asia were introduced through the efforts of André Michaux and others.

As a gracious host he takes us in leisurely succession through many Carolina estates and settlements which have been carefully preserved or understandingly rejuvenated—calling our attention to such details as the varied glow of yellow jasmine, Lady Banksia roses, azaleas and crêpe myrtle over a garden wall.

Mr. Shaffer's book is a literary achievement, valuable for its historic background and memorable for the highlights in glimpses of southern personalities.

HOWARD SWIFT.

Arrow-poison in Ecuador

WHITE WATER AND BLACK MAGIC. Richard C. Gill. 369 pages, illustrated and indexed. Henry Holt & Co., New York, 1940. $3.

Among the recent popular books describing that once mysterious land, eastern Ecuador, and its inhabitants, Mr. Gill's will perhaps be of the greatest interest to readers concerned with plants. Throughout it, the author emphasizes his favorite subject—the uses of plants in medicine or in hunting and fishing. The "black magic" of the title is the well-known curare, an arrow-poison used by many Amazonian tribes. Recent medical discoveries concerning the possible use of curare or its botanical components in the treatment of certain forms of paralysis have given an impetus to the study of the poison in its native countries; as a popular account of its preparation, the latter chapters of the present book are a welcome addition to literature on the subject. In addition to curare, Mr. Gill has investigated many other items in the vast pharmacopoeia of the Ecuadorean Indians. His account of the preparation and uses of these plant-products is instructive and entertaining.

By years of residence in eastern Ecuador, the author brings to his task an accumulation of first-hand knowledge which cannot be acquired by the casual traveler. In a fluent and readable style, Mr. Gill describes ranch life, the pleasures and trials of South American travel, and the mental processes of Indians of various tribes. In the latter explorations, those of a psychological nature, he employs a method which is not only amusing, but highly instructive to any readers who feel inclined to visit the same region.

The book is illustrated by photographs which add greatly to its value, although some of them lack clarity. Those travelers who have attempted to expose and develop film in the humid conditions of the rain-forest will appreciate the difficulties of such photography.

A. C. SMITH.

Versatile Author

GARDENING FOR FUN, HEALTH AND MONEY. A. Frederick Collins. 297 pages, illustrated and indexed. D. Appleton-Century Co., New York. 1940. $2.

There is not much to be said. A man who has written 90-odd books on nearly as many subjects could scarcely be expected to realize that gardening is something that one must really understand before he can write about it. But a good publisher should know, and it is surprising that this one has issued a book that reads like a collection of high-school boners.

CAROL H. WOODWARD.

A Personal Viewpoint of Plant Morphology

THE EVOLUTION OF THE LAND PLANTS (*Embryophyta*). Douglas Houghton Campbell. 731 pages, illustrated, indexed, and with topical bibliographies. Stanford University Press, Stanford University, California, 1940. $6.50.

Professor Campbell here espouses the hypothesis of a polyphyletic origin of the angiosperms; that is, that the flowering plants, as we know them today, did not arise from a single simple type, but had several points of origin and are today similar only because of a chance (homoplastic) parallelism. Because of his long work in the field, every plant morphologist will follow his exposition with interest. However, in spite of his repetitively stated championship of this hypothesis, it is our opinion that he has not really convinced himself of its validity. The arguments he presents for such a viewpoint are often purely speculative and such inferences as he does draw from them seem to be built on

ground less firm than those conclusions with which he disagrees.

As a record of probably more than a half century of personal investigation in the field of plant morphology, this is an important volume; but as an adequate evaluation of the controversial points—particularly in its lack of impartial presentation of the "other side of the question"—it falls short of the promise held in the title. Fundamentally, it is not so much a treatise on the evolution of land plants as a negation of the more recently expounded theories of others. What his real convictions are—if any—concerning the points of origin of the various groups of angiosperms, we did not learn, for nowhere has he outlined his conclusions with convincing clarity.

W. H. CAMP.

Two Folio Volumes of Flower Pictures

FLOWERS: Rock Plants. Arlette Davids. Introduction by Henry de Montherlant. 1939.
FLOWERS: Tulips, Hyacinths, Narcissi. Arlette Davids. Introduction by Princess Bibesco. 1940. Each volume with 40 folio pages of reproductions in color. Hyperion Press, New York. $5 each.

Bold flowers such as hybrid amaryllis, gloxinias, gladioli, and tuberous begonias have been included in the volume on "Tulips, Hyacinths, Narcissi" in the series of flower paintings by Arlette Davids. Each illustration is a full page six-color reproduction, folio-size, of a water color painting. The Princess Bibesco has written an introduction dealing sentimentally with the flowers of spring.

The earlier book has an unfortunate misnomer for a title, for the 40 succulents reproduced are designated as "rock plants." They consist of paintings of 23 cacti, nine members of the Crassulaceae, two mesembryanthemums, one agave, and five other succulent plants, chiefly from South Africa.

In the introduction, Henry de Montherlant speaks of the lack of poetry and legend relating to cacti, then assumes a poetic mood himself over the "cult of the cactus." For those who belong to the cult the 40 reproductions of Miss Davids' colorful paintings will be pleasant to peruse.

These two books are especially suitable to use as gift volumes.

CAROL H. WOODWARD.

Print Catalog Completed

THROUGH the co-operation of the Work Projects Administration at the Botanical Garden, a catalog of photographic prints and lantern slides has recently been completed and placed in the library for the reference of the staff, members of the Garden, and other persons who have use for botanical illustrative material.

Twenty large loose-leaf volumes contain the prints of the negatives on file at the Garden, classified according to subject, with plants listed alphabetically by their generic names. The collection to date contains 13,349 prints with 15,741 references to the lantern slides. These prints, some of which appear under several classifications, represent 10,755 negatives. Of lantern slides there are 6,808 colored and 6,310 uncolored. Before the catalog was started, every negative and slide in the Garden's files was inspected, and many duplicate, out-of-date, and damaged ones were discarded.

The work has been done under the supervision of G. L. Wittrock, who has had the assistance of a total of 42 W.P.A. workers, from 7 to 15 working on the job at a time. The task was commenced June 1, 1938, and completed, so far as material on hand was concerned, Aug. 15, 1940. The files will be kept up to date by a crew of W.P.A. workers also under Mr. Wittrock's direction.

Like other institutions, the Botanical Garden permits the restricted use of photographs from its collection, charging for commercial or copyrighted material a minimum of three dollars a print, in order not to enter into unfair competition with professional photographers. For other purposes, such as educational use by another institution, a nominal charge is made according to the size of the print.

Notes, News, and Comment

Pageant. More than 300 children and a number of parents attended an outdoor pageant given Aug. 22 at the New York Botanical Garden by the Day Camp Division of the W.P.A. Field Activity Program. Five short plays were enacted with the children in fancy costume, and patriotic songs opened and closed the program. A large United States flag was displayed in the center of the grounds. Ice cream was provided by the Good

Humor Company. Teachers from the Field Activity Program prepared the children for the pageant, which was under the supervision of Mrs. Violette de Ville, Junior Superintendent, and Mr. Orestis La Polla, Technical Director.

Promotion. Donald Samson, a former student gardener who completed his work in the Science Course in April 1939, has been promoted to Head Gardener at the University of North Carolina, where he will have charge of the landscaping of the grounds around the university's new buildings. He went there as Plant Propagator last February.

Visitors. Among visitors who registered in the Garden's library during August were Jack M. Bickerton, fellowship student at Cornell; Elmer A. Claar of Chicago; Shu Y. Chen of Pennsylvania State College; Paul Zimpfer, Capitol University, Columbus, Ohio; William H. Young, University of Cincinnati; George M. Darrow, U. S. D. A., Beltsville, Md.; Camilla Bradley, New Orleans; M. F. Deming, Tappan, N. Y.; Norman C. Fassett, University of Wisconsin, and Carlos Muñoz, School of Agronomy, Santiago, Chile.

Exhibit. Ten photographs showing scenes, individual plants, and examples of photography's part in scientific research at the New York Botanical Garden are being featured in the salon at the convention of the Biological Photographic Association in Milwaukee Sept. 12-14. The photographs are all the work of Miss Fleda Griffith.

Field Trips. The Torrey Botanical Club was conducted on two field trips the week-end of Aug. 24-25 by Dr. H. N. Moldenke, one, with other local organizations, to Seeley's Notch and the other to Watchung and Washington Valley, N. J.

Retired. George T. Hastings, for many years one of the leading spirits in nature study for young people in New York, and frequently a lecturer and leader of trips at the Garden, left Aug. 20 for California, where he plans to settle. He was retired in June from the chairmanship of the biology department at Theodore Roosevelt High School in the Bronx. Until a successor is appointed he will continue as editor of *Torreya*, published by the Torrey Botanical Club.

New Zealand Botanist. Mr. H. Guthrie Smith, New Zealand botanist and ornithologist, died July 4 in his 80th year. He was widely known for his interesting books on the life and habits of the rarer New Zealand birds and his graphic botanical history of his own sheep-ranch. He visited the New York Botanical Garden in 1920.

Groups. Six girls from 11 to 14 years of age made a special trip to the Garden from Cedarhurst, L. I., Aug. 30 to visit the Main Conservatories. On Aug. 20 members of the Garden Department of the Ridgewood Woman's Club visited the conservatories and the annual and perennial borders.

Gardeners. Nearly 100 men and women, in New York for the convention of the National Association of Gardeners, came to the New York Botanical Garden the afternoon of Aug. 22 and made a general tour of the grounds. Led by more than a dozen guides from the scientific and gardening staffs, they visited Range 2, the perennial borders, formal beds, waterlilies, annual borders, dahlias, asters, and chrysanthemums (not yet in bloom), Main Conservatories, Thompson Memorial Rock Garden, and the collection and experimental beds of daylilies, where Dr. A. B. Stout explained the work being done in breeding. The group was addressed by Dr. William J. Robbins in the Museum Building, also by Harold Graham, one of the association's trustees, at the end of the tour.

Fellowship. J. P. Carabia, of the Colegio La Sale in Havana, came to the New York Botanical Garden the last of August on a Guggenheim fellowship for a year of preliminary work on the flora of Cuba. Mr. Carabia spent several months at the Garden in 1938.

Author. Dr. C. Coleman Berwick is Assistant Medical Director for the Metropolitan Life Insurance Co. in San Francisco. His hobby is the subject of the article beginning on page 208.

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

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CAROL H. WOODWARD, Editor
October, 1940

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Cover Photograph by Charles Weiss*

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ECONOMIC PLANTS

Descriptive labels introduced during the past year for the plants which have uses as food, beverages, drugs, shelter, or commercial products have made the two economic houses in the Main Conservatories of special interest to many visitors. Adults often linger long in front of the camphor tree, while they read of how expert the Chinese are at extracting the crystals from the bark of young shoots. They examine the tea-plant for its small camellia-like flowers. They read about the products derived from the cola, chicle, and allspice trees, and wonder how a safe canoe could be fashioned from New Zealand flax.

Their reveries and discussions are likely to be interrupted by a class of school children, one of whom is reading aloud the label describing how cotton fibers are formed, or the one which tells how a peanut grows, or how coffee and chocolate are obtained from the "beans" or fruits of trees.

Many of the plants in the economic houses (one of which is for tropical species and one for plants of temperate regions) are young specimens, too immature to show their eventual character or to bear the fruits for which they are known. Indoors and far away from their natural surroundings, they can not be expected to assume the gigantean grandeur of the tropical forest trees that some would become in the wild. The majority of them have been raised from seeds which the Botanical Garden has obtained from explorers and from institutions in distant parts of the world.

The New York Botanical Garden has long been developing its collection of plants of economic value. Recently, as one step in making the collection of greater interest and value to the public—adults and young people alike—considerable research has been done on the history, uses, and preparation of products from the plants, and informative labels have been prepared for each species on display. This is part of the educational work of the institution, and it has been gratifying to see that the people are interested, not only in looking at beautiful, curious, or otherwise interesting plants, but also in learning something about them. Those who spend half a day in the Botanical Garden's conservatories may see, concentrated within the glass walls, more plants of economic importance than they would be likely to see on a trip around the world.

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* Through the co-operation of the Work Projects Administration.

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Korean Chrysanthemums

A Chapter in Horticultural History

By Carol H. Woodward and Natalie Gomez

THE LUSTROUS TONES in the new chrysanthemums known as Korean hybrids, coupled with the hardiness of their roots as compared with other late-blooming varieties, have given this group a place of increasing importance in autumn gardens. Ever since ***Mercury*** appeared on the market in 1933, the interest of gardeners in this new race has been mounting steadily. As new varieties have been introduced from year to year, the form of the flower has changed from a somewhat ragged single type of bloom to a single or semi-double flower of more even proportions and recently to a double flower, as in ***Burgundy*** (1939), and a few earlier introductions, also ***Goblin*** and ***Gleam o'Gold*** (1940), and the equally new ***Pygmy Gold,*** a double-flowered dwarf.

Bronze, wine-red, rose-pink, copper, gold, and white are among the colors to be found in the Korean hybrids, but in addition to their decorative qualities, to many gardeners an important factor is that even in the north their roots may be left outdoors over winter. Other chrysanthemums, though often vigorous enough to keep on blooming after frost, may not be reliably hardy, so they are frequently protected through the winter in a coldframe.

Whence came this new quality in the queen of autumn flowers?

The Koreans have been developed during the past few years at the Bristol Nurseries, Bristol, Conn., by Alex Cumming. For many years this nurseryman and breeder had been striving to bring a strain of hardiness into the chrysanthemums. He had done some work with *Chrysanthemum arcticum*, crossing it first with ***Barbara Cumming.*** The plants resulting were hardy, but lacked substance in the flower, so Mr. Cumming proceeded to look elsewhere for a parent which would produce good hardy offspring of desirable flower character.

Orion is a starry yellow Korean hybrid, slightly less robust and less hardy than some of the others, but well covered with bloom throughout the days of autumn.

In 1927 he received some plants of *Chrysanthemum sibiricum,* which is commonly known in the trade as *C. coreanum.*

"At that time we were trying all species," Mr. Cumming has stated, "but 'coreanum' particularly impressed me because the stock planted out in 1928 over-wintered perfectly the first winter with us under severe conditions that injured many other species. That was enough to suggest its desirability as a parent. From crosses made during the season of 1928, a few seedlings were selected as being possible hybrids, particularly one numbered 64-29, the result of a cross between ***Ruth Hatton*** and 'coreanum'.

"The first hybrid introduced was ***Mercury*** in 1933, to be followed the next year with the set including ***Apollo, Mars, Diana, Ceres,*** and ***Daphne.***"

The introduction of *C. sibiricum* into America has been for some years a question of dispute among plantsmen and botanists.

Concerned in the American history of this subject, as the Journal has been able to trace it by means of correspondence and investigation, are a

missionary in Korea, an American botanist on a trip of exploration in the Orient, the Arnold Arboretum, and various American seedsmen and hybridizers—all of them independent factors in the beginning.

J. G. Jack of the Arnold Arboretum (now Assistant Professor Emeritus), is one of the two Americans responsible for the introduction of the native Korean plant into this country, the other being Harlan P. Kelsey, nurseryman, of East Boxford, Mass. For many years Professor Jack and Mr. Kelsey have each been credited with being the first to bring the plant to the United States. It is true that each did introduce it, but quite independently.

Professor Jack, in the course of an expedition in 1905, collected *Chrysanthemum sibiricum* in Korea and presented plants to the Arnold Arboretum. According to Seth Kelsey, son of Harlan P. Kelsey, the latter, in 1914, obtained his stock of *C. sibiricum* from a missionary in Korea.

Mr. Cumming is of the impression that he received his original specimens from the Arnold Arboretum, and that the following year (1928) he was given one or two plants of the same species by Harlan P. Kelsey.

There has been some uncertainty as to the name itself, but it now seems clear. *C. coreanum* is listed in L. H. Bailey's Hortus, also in Alfred Rehder's Manual of Cultivated Trees and Shrubs, merely as a horticultural name. *C. sibiricum* appears in the supplement to the 1935 edition of Hortus with no special comment aside from a brief description. The revised edition of Dr. Rehder's Manual (1940), in describing *C. sibiricum,* appends the note that recently developed hybrids of this species are known as hybrid Korean chrysanthemums.

Quoting from a letter which he had received from the Arnold Arboretum, John C. Wister,[1] Secretary of the Pennsylvania Horticultural Society, writes:

"There is no such thing as *C. coreanum.* This is merely a trade name without botanical standing. The plant referred to is *C. sibiricum.*

"It was introduced by Professor J. G. Jack of the Arnold Arboretum from Korea to the Arnold Arboretum in 1905, flowered there in 1906 and was identified by Dr. Alfred Rehder. Plants and seeds from this introduction were distributed by the Arnold Arboretum to R. & J. Farquhar, the seedsmen, of Boston, who grew this in their Dedham nursery and advertised it for sale, with colored illustrations, under the name of ***Autumn Glory*** in 1913 (page 106 of their catalog). They probably sold some plants before that time.[2]

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[1] For much of the information contained in this article, the authors are indebted to Mr. Wister.

[2] The preceding catalog listed ***Autumn Glory*** among "Novelties and Specialties, 1912" with the following description: "A new hardy species from Corea forming dense bushy plants which in the autumn are covered with small single white daisy-like flowers. This variety will prove of great value for late bloom in the hardy border."

"Plants or seeds grown on the estate of Mr. T. E. Procter, Topsfield, Mass., flowered about 1908 and plants and seeds may have been distributed by him also," Mr. Wister continued, adding:

"Prof. Jack . . . stated . . . that he never claimed to be the first person to introduce it (*C. sibiricum*) but that he did find it near Seoul, Korea, and brought it to the Arboretum in 1905.

"He states that the name *sibiricum* goes back to 1837, when the name *Leucanthemum* was used instead of the name *Chrysanthemum,* and states that in 1735 the plant had been recorded and believed to be a synonym for *Chrysanthemum arcticum* of Linnaeus.

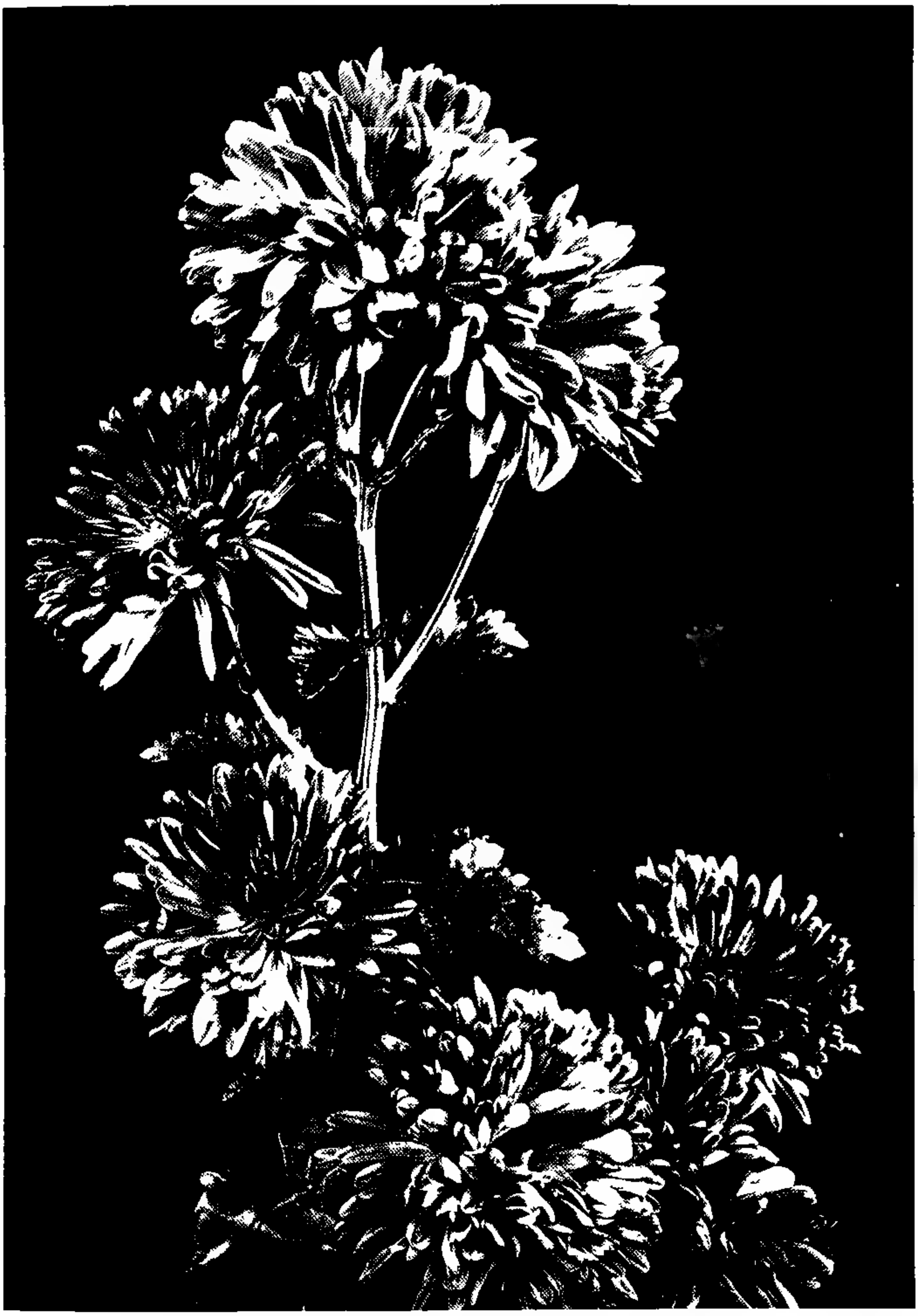
"Prof. Jack believes the plant was in cultivation in the Botanic Garden at St. Petersburg, long before 1856 and says they offered seeds of it in exchange in 1863. Prof. Jack further states that the plant was very widely distributed by the Arnold Arboretum between 1905 and 1915 and that Farquhar sold large quantities of plants."

It has been said that E. H. Wilson brought the species to this country but it is not listed among his introductions.

While it has been the subject of much discussion in horticultural circles, the original *C. sibiricum* might never have become responsible for a whole new line of outstandingly beautiful flowers if it had not attracted the attention of a brilliant hybridizer. *C. sibiricum*, itself, while undeniably attractive, is not spectacular. It is extremely hardy, a native of Korea and Siberia. Growing 3 to 4 feet in height, it bears single daisy-like flowers 2 in. across, opening pure white but changing to pink, occasionally with carmine-pink tones in maturity. But it lacks many qualities needed in choice garden flowers and remains a characteristically wild species.

Alex Cumming, in his search for improvements in chrysanthemums, seeking to give the gardening world plants of increased vitality, hardiness, color range and earliness of bloom, came to the conclusion that the possibilities of crossing cultivated species were exhausted and that the qualities which were lacking, particularly hardiness, were to be obtained only by a cross with a sturdy wildling. This meant a long and laborious process but it was the only way. *C. sibiricum*, because of its vigor and hardiness and the attractiveness of its white flowers occasionally flushed with pink, was Mr. Cumming's choice for the experiment. The first cross was made in October 1928. In more than 2,000 years of chrysanthemum culture, this was the first known time that a new species had been introduced. According to available records, only two species, *C. indicum* and *C. morifolium*, had been used between about 550 B.C. and 1928 A.D. Mr. Cumming states modestly in his book "Hardy Chrysanthemums" that it happened to be his good fortune to discover that *"C. coreanum"* was a receptive and adaptable species and that he "stumbled" across this valuable parent before it was discovered by another breeder.

The first selected seedling of Mr. Cumming's initial cross between ***Ruth***



Indian Summer is fiery in the tone of its double flowers. A strong erect and branching plant, it blooms over a long season.

Hatton and *C. sibiricum* was scarcely distinguishable from others in the early stages, but gradually it acquired distinctive characteristics. While still in bud, the plant was selected for its rugged type of growth and peculiar arrangement of flower buds, in a spiral or candelabra-like spray. When the flowers opened, their unmistakable Korean characteristics became obvious. The flowers were in odd cup formations, developing two to four rows of rays, ragged and uneven but of a purer white than any seedling ever seen before and with a substance and gloss that positively indicated their Korean parentage. Although of an untidy and ragged appearance, it was unmistakably a successful cross. This particular plant was not preserved, somewhat to the originator's regret now, but it has gone down into the record as the first hybrid to be followed eventually by the numerous varieties now in cultivation.

An interesting question presented itself. Self-seedlings of *C. sibiricum* always were white and the first hybrid parent, ***Ruth Hatton***, always bred in the typical colors of the florists' chrysanthemums. Where did the hybrid seedlings from this and subsequent crosses get their range of luminous and almost indescribable tints and colors now associated with

Nancy Copeland is a typical example of a Korean hybrid chrysanthemum. Of spectrum red, the flowers have an opalescent sheen. It is sturdy, thoroughly hardy, and suitable for greenhouse as well as outdoor culture.

"A GLORIOUS GROUP was noted . . . at the New York Botanical Garden, where the culture of garden chrysanthemums has attained super-excellence."

Thus does Mr. Cumming himself speak of the Garden's plantings in his book "Hardy Chrysanthemums." The 71 varieties being grown at the Botanical Garden are at their peak the latter part of October and will remain in bloom until killing frosts. Among them are many Korean hybrids.

Koreans? Mr. Cumming advances a theory put forth by Mrs. J. A. Vanderpoel, that "no actual new color factor has been added but that the petal surface of 'coreanum', which is starch-like and glossy, elaborated existing colors through greater reflection, just as the surface of a color-film screen may affect the reproduced picture." However, in accounting for the amaranth-red of ***Mars,*** Mr. Cumming goes back five generations to the use of two good crimson varieties (***Grenadier*** and ***Mrs. Calvin Coolidge***) to produce a seedling which became one of the forebears of ***Mars.***

Whatever fortunate forces have been at work, the results present us with a range of colors some of which have never before been seen in hardy chrysanthemums. If this were the only achievement of the hybridization, it would go far to win favor in the garden world. But, added to that, the inherent hardiness of the Korean ancestor persists in the strain, as well as its earliness of bloom. The only factor to be perfected now is the frost-resistance of the flowers themselves.

While every season sees new varieties offered in the Korean strain, the original group is still one of the most popular. Introduced in 1933 and '34, from the initial cross made in 1928, the first five varieties bear significant names. After the crimson ***Mercury*** came ***Ceres,*** a coppery-gold, named for the goddess of grain. ***Diana,*** after the goddess of the hunt, is a soft rose-pink. The blood-red of ***Mars*** is a suitable reminder of the god of war. ***Apollo,*** a glowing bronze, honors the god of manly beauty by its virile color. ***Louise Schling,*** of salmony red, and ***Daphne,*** pink, also belong in this early group. These as well as many subsequent introductions, were all singles. Soft luminous pinks and true lavenders as well as intense deep reds and maroons followed in singles and later in doubles. The double Koreans do not differ in appearance very much from the hortorum varieties but have greater hardiness and a remarkable color range not found in the older sorts. A full description of colors and tints of even a dozen varieties would take much space. While color photographs give a fairly accurate conception of the individual flowers, it is necessary to see the plants growing and blooming to appreciate fully their other qualities—substance, sturdy branching habit, abundance of bloom, earliness and hardiness.

Syrup And Sugar From Maples

The Story of How a Native Product, Once a Necessity, Has Become A Culinary Luxury Today

By Edmund H. Fulling

IT is an oft told story, that of maple syrup and sugar, but there are many who have never heard it, and until two years ago the writer was among them. So he journeyed to the leading maple sugar state, Vermont, to watch the manufacture of this native American sweet.

Originally considered indispensable on the dining-table, maple syrup and sugar are unique among commodities today, for in changing places with the once expensive cane sugar, they have been converted from necessities into luxuries. To understand how this came about, we must first consult the early American chroniclers, for it is they alone who can give us the necessary background for a proper perspective on the maple syrup and sugar industry.

It Began With the Indians

The American Indian was truly a child of Nature and his knowledge of her secrets have long been sung in verse and prose. He knew the therapeutic qualities of trees and herbs and passed on to the white man an acquaintance with plants as sources of human food which has since been augmented only by way of refinement rather than in new discoveries. It is natural to suppose, therefore, that he knew how to secure sap from the maple, though some have cast doubt on his resourcefulness and declared that he probably learned the method from the white man. The technique was simple, for it involved only tapping the trees at the proper season and then reducing the water content of the sap, either by boiling or by successive freezings in shallow vessels. By the latter method the frozen surface water would be discarded each time until a syrup of suitable density was ultimately secured. Before fire-resistant vessels came into his hands from the white settlers, the Indian probably also obtained maple sugar when it crystallized on the surface of the hot stones that were dropped into the syrup to hasten evaporation. Just how the Indian learned the procedure is, of course, unrecorded, but there are abundant legends. Our conviction today that this knowledge passed from the red to the white man is founded on writings of early explorers, on linguistic evidence, and on Indian ceremonials associated with the practice. In the languages of various aboriginal tribes of northeastern North America

there are many allusions to the sap-yielding and sweet-producing qualities of the maple. They are truly Indian terms, not merely conversions of the white man's language, and it is very unlikely that such terms would have existed in their speech had not the Indians already been familiar with maple sap. Even less likely is it that they would have developed ceremonial practices in connection with something learned from their oppressors.

As the Colonists Told the Tale

So our story begins sometime during the period of colonial expansion in America, somewhere in the valley of the St. Lawrence River, probably in Quebec or a neighboring part of Canada where Frenchmen made friends with the Indians. Or, it may even have been in the northeastern part of what is now the United States. For a definite date we must accept 1673 since it is from that year that the earliest extant written record comes down to us.

Wherever the maple tree grew, the Indian had little else with which to sweeten his food, though he occasionally resorted to the pods of the honey locust. So in early spring, to supplement his diet, he gouged the trunk or a large root of a maple tree with his tomahawk, and the colorless watery sap which slowly issued from the wound he directed into a hand-made wooden, bark, or clay receptacle by means of a curved piece of bark, a reed, or a twig of alder or sumac with the pith removed. Two-foot logs from any tree at hand, split lengthwise and hollowed out, were probably most frequently used, though containers of elm bark, also of birch, the universal provider, were likewise employed. The receptacles were placed on the ground, for the tappings were only two to four feet up the trunk.

The Indian then reduced the sap to syrup by the tedious method of repeatedly dumping hot stones into the liquid, since neither his clay containers nor his wooden troughs and bark receptacles could withstand prolonged heating over an open fire. Never having practised smelting, the Indians originally knew nothing about metal for such purposes. But it was not long after contact had been made with the white settlers that they were found to be using copper or iron caldrons for sugar-making. Their primitive type of container could still be effectively used for storage. The journal of a white settler captured by the Indians in 1755 tells of a 100-gallon elm bark trough used by his captors for storing the sap.

Today It Is Done By Farmers

Perhaps 90 percent or more of the maple sap gathered nowadays is collected by individual farmers scattered throughout the producing states. A few of them carry it through all the processing stages themselves and put the syrup or sugar on local markets as their own products, but the

majority process it only part way and then sell the product to companies which complete the operations necessary for marketing. In either event the individual farmers with their holdings of a few hundred up to several thousand trees form the foundation of the industry. Large holding companies which tap their own trees in sufficient quantity to maintain a year-around syrup and sugar manufactory are rare, if there be any at all.

In early spring, beginning about the middle of March, the farmer inspects his trees, probably day after day, by boring a hole ⅜ or ½ inch wide in the trunk of one each morning until he detects a slow emergence of sap. The precise time when the run will begin can not be predetermined, and all he knows is that when cold snappy nights are followed by warm days the time is approaching when work in the woods will begin. In addition to the weather, latitude has considerable influence in this matter, and records show that the flow has commenced as early as the first of February and as late as early April in the Northeast. In the South, of course, the season begins earlier. In 1938, when the writer visited northern Vermont on March 23, it had not yet begun. When it once begins it continues intermittently, according to the weather, for four to six weeks. The period is quite variable, however, and in a record covering 33 years from 1880 through 1912 the longest run was 57 days, the shortest 9 days and the average 34 days.

Having determined on a particular day that the run has begun, the farmer and his assistants go from tree to tree and bore into each of them a tap hole no deeper than 3 inches, and into each hole insert slightly upward a metal spile, various designs of which are on the market. In the old days, a stout piece of alder or sumac about 6 inches long was used for this purpose, the pith having been removed, probably by means of a hot iron rod, to provide a channel for the sap. Generally, only one tap is made on each trunk in order not to impair the vitality of the tree; occasionally, on very large maples, two holes are made, on opposite sides of the trees; but the monstrosities of thirty taps and buckets on one tree, as have been recorded, is a desecration of Nature's gift.

Each spile is provided with a hook from which a pail is suspended to catch the drippings—wooden pails in the old days, shiny tin pails today. The former were unclean and discolored the sap, and galvanized receptacles are barred because of poisonous qualities in the metals used for galvanizing. The pails as they are hung today are usually provided with covers, but this practice, as is true of all innovations, has been attended by argument as to its merit.

Two men working together can tap sufficient trees to hang from 400 to 500 buckets a day, and unless the work has started somewhat in advance of the sap run, it may extend into the night in large sugar bushes, as the scenes of operation are called. At one time, at least, there were bushes in New York State which at the height of the season displayed between

Photo by U. S. Forest Service

Sugaring in New York—a large well appointed commercial sugar house. The aperture at the top is kept open for the escape of steam during the evaporation of the sap.

8,000 and 17,000 buckets. The usual run today, however, is between 300 and 1,500.

Probably never does sap run from the maple in a steady stream. It always drips but the drops may appear in such rapid succession, more than one hundred per minute, that almost continuous flow results.

The next operation involves collecting the sap, a phase of the work which must be performed daily, for postponement markedly lowers the quality of the ultimate product. In the old days, it was done by the men carrying two wooden pails suspended from a sap-yoke which rested on their shoulders and around the back of the neck, very similar to that of the picturesque milk maidens who still perform in parts of Europe. Today, however, in the smaller sugar bushes, a sled or stone-boat is used, while in the larger groves horses have superseded the pairs of oxen bowed low under their yokes of days gone by. Preliminary work is usually necessary in opening the woods before any work at all is undertaken.

A large circular or rectangular wooden container is securely fastened to the low sled, and as it winds through the woods the contents of the tin buckets are poured into it, either directly or from intermediate containers when trees far from the sled are concerned.

The Evaporation Process

The sugar-house is the scene of subsequent operations. It is usually an old single-story weather-beaten barn-like structure located on a slight slope which permits the sap from the collecting sled to be delivered by gravity

through a pipe or trough into a storage tank either within or just outside the house, preferably on the shady side. What may be regarded as the ultimate refinement in this phase is a system of connected pipes running through the orchard and supported on short posts or fastened to the trees. Sap is poured into the system through funnels at various points and thus flows directly to the sugar-house. Gently sloping topography is an obvious requisite for this system, which for various reasons has not been so widely adopted as one might suppose.

Inside the sugar-house the principal structure is the evaporator which, though still crude-looking, is a great improvement over the Indians' trough into which hot stones were placed, or the early settlers' round-bottomed iron kettle swung over an open fire without protection. The evaporator is a heavy iron rectangular pan, usually 2 to 6 feet wide, 4 to 8 inches deep and 6 to 24 feet long. It rests upon a heavy heat-resisting enclosed foundation, provided with iron doors and draft control for the fire which roars at one end of it. The heat travels the length of the pan, directly through flues to the chimney. After the fire is started, sap is run into the pan from the storage tank, and by means of an automatic regulator a layer of proper shallowness is maintained. As it heats, the watery sap circulates the length of the tank between variously dis-

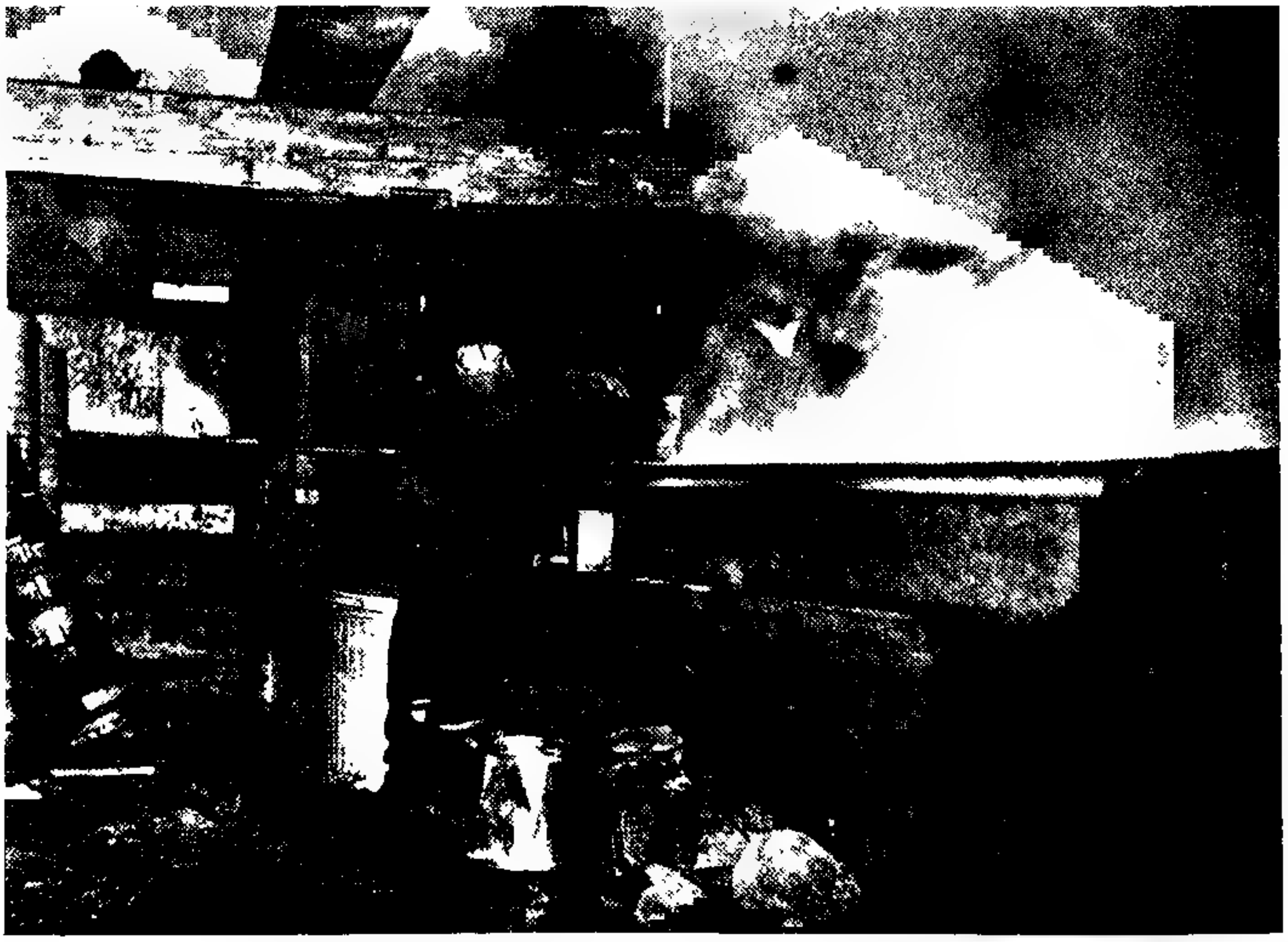


Photo by U. S. Forest Service

An evaporation tank in a sugar house in Vermont, from a photograph by B. W. Muir.

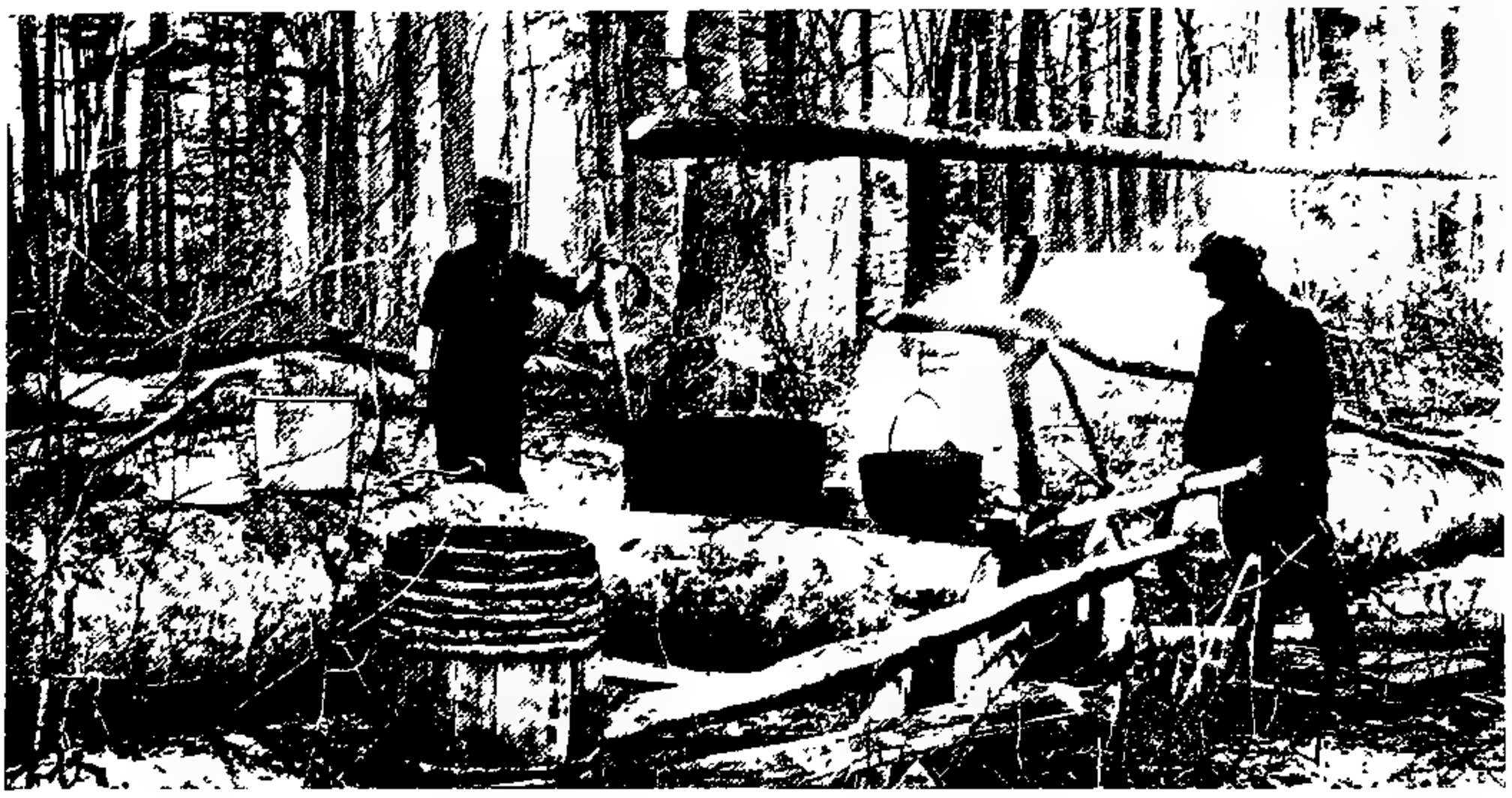


Photo by U. S. Forest Service

The old-fashioned method—early settlers with their iron kettles over an open fire.

tributed partitions and thus travels a distance of perhaps 50 feet before being drawn off. To increase the heating surface and thus speed up the evaporating process, the bottom of the pan is corrugated or provided with many narrow troughs.

In addition to sugars and other constituents, besides water, maple sap contains lime and malic acid. These, upon heating, unite to form malate of lime which at the beginning of the season ordinarily amounts to about 6 per cent but later may constitute from 25 to 30 percent of the total dry weight. This must be removed either by skimming or by straining the hot syrup as it is drawn from the evaporating pan.

Fresh sap, when boiling, always has a temperature of 213°F., one degree above the boiling point of water, but as the sap thickens and the density of it increases through evaporation of water from it, higher and higher temperature is required to maintain the boiling. It is generally agreed that when the density reaches such a point that one gallon of the syrup weighs 11 pounds, the sap is completely processed so far as evaporating goes and is ready to be marketed. By the time this density is acquired the temperature of the boiling sap has gone up to 219°F., and when this point is reached the farmer knows that his hot sap is ready to be drawn off. By suitable regulation of his fire, of the depth of sap, and of the rate of the flow through the pan, the farmer can maintain an almost continuous flow from one end of the pan to the other where it is drawn off and impurities are removed. The modern evaporators, according to size, have capacities for converting from 25 to 400 gallons of sap into syrup per hour. The maple syrup is put into containers and cooled before shipment to large plants for further treatment.

If, however, the farmer wishes to make his own maple sugar, for either personal consumption or local merchandising, he proceeds with the so-called "sugaring-off". This merely involves continued heating under very careful supervision to avoid scorching until the boiling temperature has been raised by the increased density to 230°F. The early settlers tested it more crudely by pouring a bit of the syrup over snowballs or into cold water. When "done", it becomes very waxy, or congeals into a confection, and the traditional sugar parties of New England were developed around this home industry as seasonal events of frolic and recreation.

Cane Sugar Becomes a Usurper

In early colonial days, before the introduction and importation of cane sugar from southern climes, maple sugar was an important and necessary commodity on the food market. The annual production of it continued to increase until 1860 marked the height of the industry. About that period cane sugar began gradually to replace it and today maple sugar is classed as a luxury. The demand for this luxury, in the form of both syrup and sugar, has kept the industry alive, but an increasing amount of adulteration, especially with cane sugar products, has prevented greater expansion. A few years ago it was estimated that approximately seven-eighths of the total sap produced was adulterated before being placed on the market, an amazingly high percentage, to say the least. Today the producers of pure syrup do considerable business in furnishing their products as an ingredient for blended brands put out by other concerns. It is the use of more adulterants, therefore, which has met increased demand, and the producers of the pure products, suffering thereby, have resorted to organized campaigns of public education in order to increase an appreciation of and demand for the pure product.

Modern Manufacturing Methods for Maple Syrup and Sugar

The town of St. Johnsbury, Vermont, a typical New England community of about 10,000 inhabitants, may be regarded as the heart of the maple syrup and sugar industry in America, nay, in the world. It is the seat of the largest preparers of maple products, the Cary Maple Sugar Company, and into the yards of this company there arrive annually thousands of gallons of maple sap from many points in the states of Vermont, New Hampshire, New York, Pennsylvania, Ohio, Maryland and West Virginia, as well as from parts of southern and eastern Quebec.

Let us follow the processing of the sap through the successive stages.

1. Every autumn, trainloads of heavy iron barrels with one bunghole in the center, laterally, are distributed by freight to farmers in the regions already noted. A local representative of the company at each of these points, some merchant or other person of standing in the community, supervises this allotment when necessary.

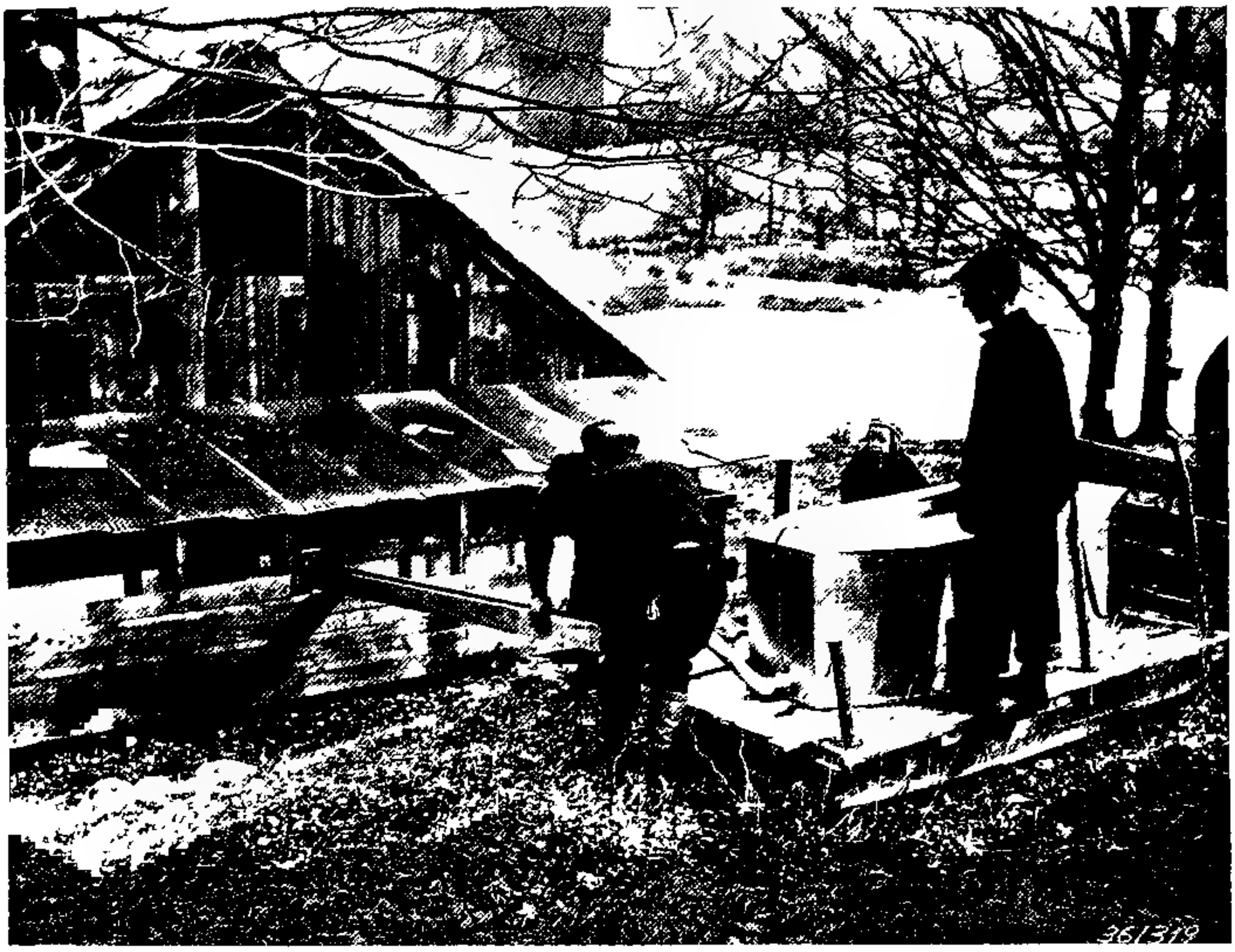


Photo by U. S. Forest Service

Pouring sap from a gathering tank into the sap house, from a photograph taken near Green Mountain National Forest by B. W. Muir.

2. Next spring, after sap has been collected, boiled down and barreled by the farmer, these casks are brought to the railroad and there the local representative, together with an agent from the main office, tests the density of the sap, agrees upon prices with the farmer according to quality of the material, and concludes the deal with cash payment. It is in this manner that 95 percent or more of maple sap is secured by the syrup companies, for as already noted, they do not maintain large holdings of timber or do much tapping themselves.

3. Upon arrival of these barrels at St. Johnsbury, their contents are retested for density and then either stored in the same containers for use during the coming year or immediately put through the process described below. A certain degree of density is necessary for preservation while the syrup is being stored, so after each barrel is tested the contents are boiled or diluted as required to make them uniformly proof against spoilage.

4. When the syrup is to be used, either from stored cans or newly arrived shipments, each barrel is rolled over one of four troughs in the

floor of the basement and its contents are thus poured into one of two huge 10,000-gallon open rectangular storage tanks in the sub-basement.

5. From these tanks the syrup is pumped into huge copper-lined caldron-shaped and elevated containers on the fourth floor, whence it is distributed by gravity to other parts of the plant.

6. On the fourth floor it is forced through filters to remove foreign matter, and it is hardly likely that any such material escapes the straining, for the syrup must pass through a heavy, tightly woven canvas sheet, a layer of filter paper, and a one-inch layer of chalk preparation secured for the purpose from California.

7. If the batch being processed is of high-grade quality suitable for sale as pure maple syrup, it then finds its way into smaller storage tanks and then through the bottling and canning stages.

8. If it is of poorer quality and to be made into sugar for the tobacco industry—and this industry, surprising to learn, is the greatest user of all maple products—it is run into other elevated caldrons and there boiled until the steam rising from it attains a temperature which indicates that the desired density has been attained.

9. The thick hot syrup is then run into horizontal troughs where it cools and is stirred by revolving paddles to secure uniform texture.

10. From the stirring trough the very thick syrup, scarcely able to flow, is drained through heavy hand-operated valves into moving boxes lined with waxed paper and carried into the cooling room on rollers.

11. After several hours the syrup will have solidified into blocks of maple sugar ready for shipment. A core is bored out of every thousandth box and tested in the chemical laboratory.

12. Better grades of syrup are also manufactured into sugar in a similar manner, and then converted into confections, either by the same or by purchasing companies.

Physiology of the Maples' Sap-yielding Phenomenon

Every living plant contains what is known as crude sap and elaborated sap. The former consists of water absorbed through the roots together with any minerals or other ingredients which may be dissolved in it. This crude sap ascends through the plant by a force not yet fully understood until it reaches the leaves. There, as well as in the cambium beneath the bark and in every branch and root tip, the dissolved components of the sap and a small portion of the water participate in the building up of tissue. Most of the water itself is lost by transpiration, that is, by evaporation from the leaves. In the leaves the water of this crude sap unites with carbon dioxide from the air and produces sugar, and this product either is used as a source of energy through oxidation where it is pro-

Photo by U. S. Forest Service

A farmer drilling 3-inch holes in a large sugar maple at the beginning of the sap run.

duced, or it is conveyed in solution as elaborated sap to other parts of the tree to be used there immediately in a similar manner or to be converted into starch and stored as such for subsequent use. In addition to being a source of energy through oxidation it also constitutes the supply of chemical compounds which enter into the actual building up of living parts of the plants. This, in general, is the outline of events as they occur in plants as a whole respecting this phase of their life. Concerning the maple, the details of the sequence seem to be as follows.

Some of the elaborated products which are built up in green leaves from glucose, the first observable product of photosynthesis, are later reconverted into glucose during summer and transported as such, together with cane sugar or with unconverted glucose, to various parts of the tree. This occurs from the time the tree acquires its foliage and begins to synthesize the material until sometime in autumn, probably just before leaf-fall. During the growing period, which is part of this time interval, as well as during the subsequent so-called storage period of August, September and October, a large part of this soluble, transportable sugar is converted in the roots, as well as in the wood and bark of the

stem, particularly in their rays, into insoluble and therefore nontransportable starch which accumulates at these points. The maximum amount of starch, after gradual building up accompanied by decrease in the sugar content, occurs in September, and though there is still some sugar at that time the quantity of it is very much diminished.

After the leaves have ceased to manufacture food in autumn at the close of the storage season in October or late September, much of this stored starch is reconverted into sugar and retained as such throughout the winter, reaching a maximum in January. After March or April, either during or just after the tapping season, reverse changes set in.

In autumn and winter, from October to January, some of the sucrose is converted as a result of falling temperatures into other kinds of sugars known as hexoses. This takes place within the living cells of the wood, particularly the rays, and constitutes a phase of tree physiology which is not at all well understood. In spring, from February to May, during the sugaring season, there are equally rapid decreases in these hexoses, caused by rising temperatures. In the earlier period they have been known to increase 12 times in weight within 120 days, reaching a maximum when the weather was coldest, and later to decrease within a similar interval to one-fifteenth of the maximum figure. During the growing season they are at a minimum. Though these hexoses are at a maximum in the wood of the tree during the winter when sucrose is in similar abundance, they are almost entirely absent from the exuded sap, constituting only a fraction of one percent of the total sugars in it.

Stated otherwise in terms of seasons, the maximum amounts of water, sucrose, hexoses and water-soluble solids in the wood are found during the winter months, the minimum during summer. Starch, on the other hand, is low in winter and high in late summer and autumn.

So far as actual scientific data are concerned in these matters, all we know is that increases in one group of substances are accompanied by decreases in the other, but it appears safe to assume that these changes really involve the conversion of one into the other through chemical processes directly affected by temperature, but particularly controlled by the influences of enzymes.

The building up of sap pressure within the tree is a natural development, but it is only when this pressure finds release at points of least resistance that outward flow ensues. The flow of sap from maples is thus not a normal event; it is purely a response to wounding, and without wounding there would not be any sap-run. As it drips from the tree the sap is, for the most part, water, 95 percent on the average. But this figure varies, and though slight, its variations are significant, for the other 2 to 6 percent of sucrose is the part the farmer is after. If it constitutes only 2¼ percent, 38 gallons of sap are needed to yield one gallon

of standard maple syrup, while a richer sap of 5 percent sucrose gives a ratio of 17 to 1. In other words, if all his trees yield sap of uniformly low quality, one farmer may have to tap twice as many trees as his neighbor in order to earn the same livelihood.

Sap-yielding Species of Maple

The exudation of elaborated sap from trees when they are wounded is not at all peculiar to the sugar maple. Many other maples display a similar character but only certain kinds produce such a quality and quantity of sap that commercial value has become attached to the product. Of the 70 or so species of maple distributed throughout the world about a dozen are native to the United States, and of these, four merit consideration as sources of sap, the so-called sugar maple, *Acer saccharum,* being by far the most important, for it yields from 80 to 90 percent of all syrup and sugar produced.

The sugar maple is found throughout the eastern part of the United States and Canada, from the southern portions of Newfoundland, Quebec, Ontario and Manitoba, also through Nova Scotia and New Brunswick, Maine and the intervening states westward to the eastern parts of the Dakotas, and southward to Georgia, Alabama, Mississippi and Texas. Though the trees produce elaborated sap throughout their range it is only in the northeastern states that the production is of commercial importance, and in that area Vermont, New York, Ohio, Michigan, Pennsylvania and New Hampshire are the leaders in descending order. The last census, previous to 1937, shows, however, that maple syrup and sugar were produced in 26 states, but Vermont and New York each accounts for about 30 percent of the country's crop. It is surprising that about 10 percent of the maple products used in the United States are imported from Canada.

The black maple, *Acer nigrum,* so similar to the sugar that it is regarded by many authorities merely as a variety of it, is equally important as a producer of high-grade products. The two are tapped without discrimination, but the black maple is not so common as the sugar.

Red maple, *Acer rubrum,* has the widest natural range of distribution of any native American maple. It is used for sugar production in the middle and western states to a limited extent, but its sap is low in yield of both syrup and sugar.

Silver maple, *Acer saccharinum,* less abundant than the above three species, will probably never be important, for its sap, though plentiful, is very subject to discoloration, and its season is short and uncertain.

Other native species are not of any importance and in foreign lands the industry has never developed.

Injury To Daylilies By Thrips

By A. B. Stout

FOR SEVERAL YEARS there has been some injury by thrips to some of the daylilies grown at the New York Botanical Garden. But during the past summer the injury was severe to plants of certain species and clones.

The thrips feed on the tender branches and flower buds of young scapes. In most severe infestation an entire inflorescence shrivels and dies while still undeveloped and every scape on a plant may thus be affected. But frequently portions of an inflorescence escape injury and there is more or less development in scapes, as shown in the illustration on page 245. For such scapes the main stem, and also laterals as well, are bent and even twisted and there are areas of the surface, especially in vertical strips above bracts, that are rough and brown in color, with several layers of dead cells. Lateral branches and flower buds in varying numbers are killed at an early age or make partial developments with symptoms of injury like those of the main stem. Flower buds which develop to flowering size are often twisted by lesions and unequal growth that result from somewhat localized feeding of the thrips. When a considerable portion of an inflorescence escapes injury some flowers may develop quite normally.

A collection of thrips obtained on infested scapes of daylilies was sent to Professor J. Douglas Hood of the Department of Entomology, Cornell University. He identified one or more individuals of four different species, and decided that the thrips responsible for the injuries to daylilies belong to the one species *Frankliniella tritici* (Fitch). Portions of Professor Hood's letter to the writer may be here quoted as follows:

> "One male of *Taeniothrips simplex* (Morison) was detected. This species apparently always feeds on *Gladiolus* and has probably followed its food plant from the natural habitat. This specimen evidently flew to your *Hemerocallis* from some neighboring gladioli, and is of no concern whatever in your present problem.
>
> "*Frankliniella fusca* (Hinds) is an indigenous form, common in the United States east of the 100th meridian or so;—a species of the humid East, so to speak. It is common on grass, but may turn its attention (as do many thrips) to neighboring plants. Thus, in spring, it is common in dandelion flowers on our lawns; and in the South the long-winged form is often injurious to shade-grown tobacco. Few specimens of this species were present in your sending, and I doubt if this species concerns you.
>
> "*Thrips physapus* Linné, 1758, is the genotype of the first genus of Thysanoptera. It is holarctic in distribution and common in the United States in dandelion and other flowers. It is never, to the best of my knowledge, sufficiently abundant anywhere to cause real damage.
>
> "*Frankliniella tritici* (Fitch), however, was the abundant species in your sending. It is the culprit. Abundant throughout all of eastern North America, it occurs on nearly every flower that grows. I have long since wearied of cataloguing its food plants, so many scores of them are there. Single flowers of even small size may contain dozens, and the species is present from spring to fall."

Hemerocallis multiflora severely damaged by thrips in the manner characteristic of this insect's attacks. Normally a producer of flowers in great numbers, this plant has been reduced to only a few healthy buds. Some of the flowering scapes, such as the one at the left, have been completely killed, while others have been greatly stunted. Corky lesions may be seen where the insects have fed.

The daylilies most affected at the New York Botanical Garden, thus far, have been plants of *Hemerocallis citrina, H. multiflora,* and hybrids which have one of these species as a parent. For these the injuries were severe to scapes and inflorescence but the leaves remained in excellent appearance. There was much injury to various individuals of the species *H. fulva* and for these it now seems that the foliage was also affected. There was severe injury to groups of plants that were separated widely in the experimental garden and frequently these plants stood close to plants of other species or groups of hybrids which suffered no injuries.

During August the entire collection of daylilies in the experimental plots and display beds at the New York Botanical Garden was treated with the tartar emetic spray that is considered useful in the control of thrips that injure other plants. It has been recommended that the application of derris or cubé in dust or in a spray may prove to be effective in reducing infestation.

Current Literature At a Glance*

By Virgene Kavanagh

Indian Agriculture. In *Soil Conservation* for August 1940, G. R. Stewart and E. A. Nicholson describe the ways in which the Hopi Indians conserve water for their agriculture. The rainfall on the croplands varies from 5 to 15 inches per year, yet the Hopis, using the same methods of terracing, irrigating, and accumulation of flood waters for many, many years, are able to grow beans, melons, squash, sweet corn, peppers and onions with great success. They seem to use no system of crop rotation, the same portion of the inherited land being planted to the same crop each year. Traditional ceremonies of planting mingle with sound conservation practices.

Rose Book. The Members' Handbook of the American Rose Society for 1940-41 has been published. As usual it includes rules for nomenclature and registration, rules for exhibitions and awards, a list of books in the library of the society, and a list of rose gardens that may be visited in the United States.

New England. Mrs. Ethel Anson S. Peckham has "A Jaunt through New England" in the July number of the Bulletin of the American Iris Society.

Wild Roses. Among the many interesting articles in the September number of *Real Gardening* are one by Francis E. Lester on "Let's Give the Wild Roses their due," by E. J. Zevitas on "Important Points about Tree Repair Work," and by Robert S. Lemmon, the editor, on "Growing Native Plants From Seed."

Oldest Club. How the Garden Club of Georgia is preparing four gardens as a memorial to the Ladies' Garden Club of Athens, Georgia, probably the oldest garden club in the United States, is told in *Horticulture*, Sept. 1, 1940.

Southern Novelties. Plants recently introduced in the New Orleans area are described in the 1940 year book of the New Orleans Garden Society, Inc.

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* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

Sensitive Plant Demonstrated During October

DEMONSTRATIONS of how the sensitive plant responds to the touch are being given hourly through October at the New York Botanical Garden. Every day, from the time the main conservatories open at 10 a.m. until 4 p.m., one of the gardeners shows the public the effect of a stimulus on the leaves of *Mimosa pudica*. This is one of the few plants that exhibits visible motion.

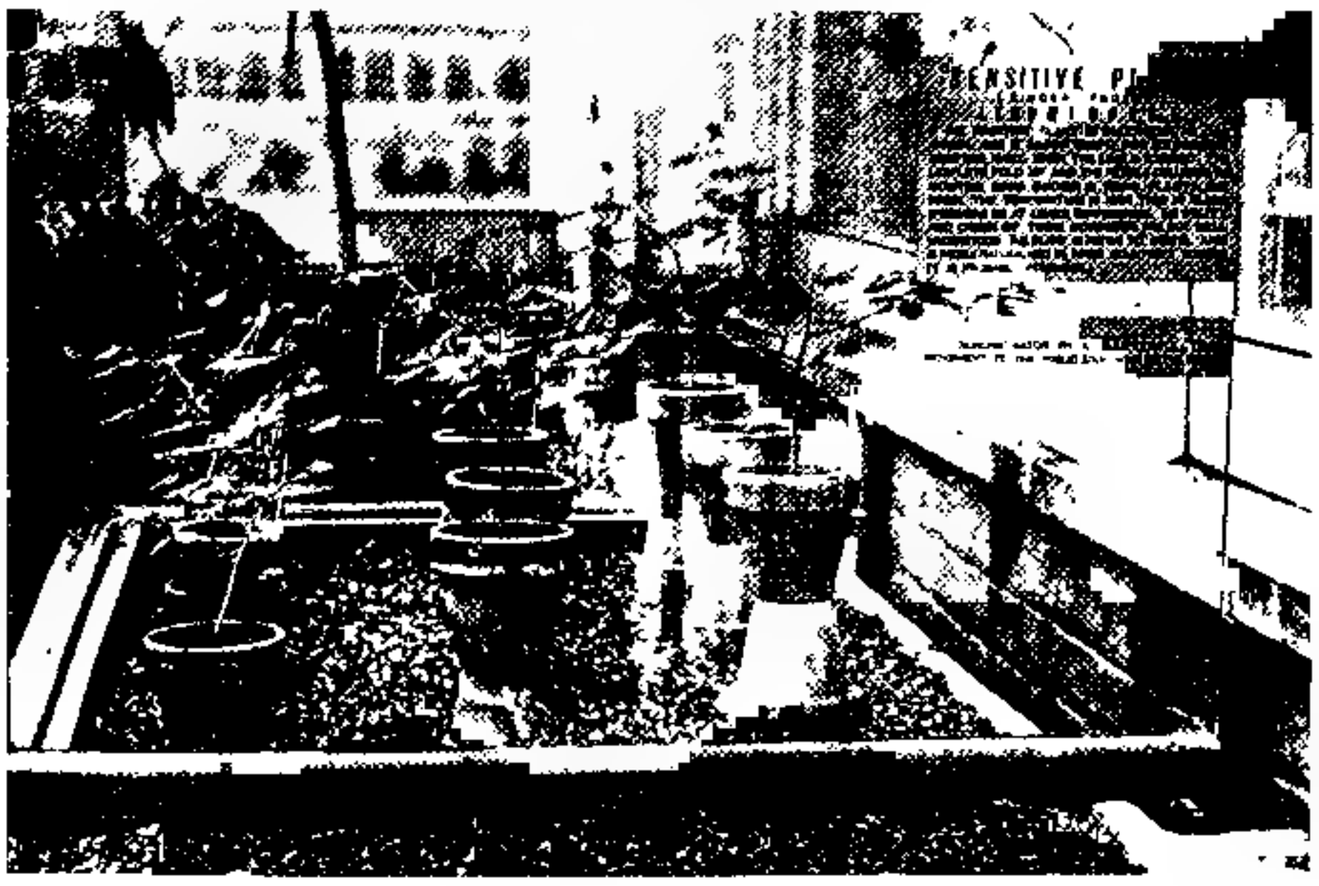
The actual leaf of the sensitive plant is a doubly compound affair, with four slender stalks, or midribs, radiating from the end of the leafstalk, each of these bearing about 30 leaflets, or pinnules, arranged feather-fashion. At the base of the leaf-stalk, where it joins the main stem of the plant, and also at the base of each midrib and each pinnule, there is a cushion filled with water which keeps it firm. This cushion helps to hold the leaves and their parts in a normal position.

But if a gust of air comes along, or heat from the flame of a match, or if the tip of the leaf is touched with a pencil, some of the liquid in these cushions is released, the cushions become partly deflated, and the pressure of the remainder of the liquid forces the leaf and its parts either downward or upward. If a sharp blow is given the leaf, the motion is so sudden that it appears as though the leaf-stalk had been broken. While the leaf-stalk drops, the pinnules raise themselves vertically until the upper surfaces of those on either side of the branch are lying close together.

Gradually the leaf will return to its normal position.

If it is stimulated too frequently it will refuse to react. If it is exposed to ether it will appear to be unconscious, and similarly will not respond to a stimulus. The leaves will close in the presence of full sun, and on a cloudy day they will assume a lackadaisical air and may or may not react. The leaves are sluggish also at low temperatures.

The sensitive plant grows wild in Brazil, and many are the stories told about it there, including the tale that its leaves react more readily to the touch of children than to that of adults, and that a robust individual will bring a more marked response than a person in poor health.



SENSITIVE PLANT PERFORMS FOR VISITORS

Above, Student Gardener A. M. Colquhoun demonstrating the reaction of Mimosa pudica. Center left, the Garden's current display of sensitive plants. Center right, an expanded leaf being touched; below at the left, some of the pinules responding to the stimulus; right, the entire leaf, except for the petiole, showing the effect of having been lightly touched with the finger.

(Photographs by Charles Weiss, through the co-operation of the W.P.A.)

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Rehder's Long Awaited Revised Manual

MANUAL OF CULTIVATED TREES AND SHRUBS. Second edition, revised and enlarged. Alfred Rehder. 996 pages, indexed. Macmillan Co., New York, 1940. $10.50.

This justly famous book has now appeared in its long awaited revised edition and everybody who is interested in woody plants will reach for it with pleasant anticipation.

Certainly it is hard to estimate the enormous amount of work which has gone into the making of this new edition. The book has been considerably enlarged; there are now 996 pages instead of the 930 of the first edition. Thirteen genera, 335 species, 220 varieties and 33 hybrids have been added. The greatest single addition of species, by the way, has been made in the genus *Rhododendron,* where 40 species were added. But the work of revising has gone far beyond that. Descriptions have been rewritten and clarified, missing information has been added, and the estimations of hardiness have been revised based on observations made during the last 12 years. Keys have been reshuffled to remove weaknesses which they formerly contained and to bring out new concepts of probable relationship. The map of North America with the climatic zones superimposed upon it, which was much too small in the first edition, has been enlarged about three times. The zones have been reduced from eight to seven and their outlines have been changed accordingly. Some of the territory, especially of the southeastern part of the United States (for instance, North Carolina) formerly included in zone VIII, has been left out.

The zones themselves have been clearly marked in color so that they are now readily distinguishable. Personally I should like to see a slight bulge in zone IV to include the region of Montreal, since most of the plants given for zone IV in the new manual so far appear to be hardy at the Montreal Botanical Garden. However, I admit that the time of observation has been too short to draw definite conclusions and besides I know that Professor Rehder himself considers his indications of hardiness only as a helpful estimate.

One unfortunate feature of the new edition of the manual and one which I am sure will bring many protests from its users are the numerous changes in nomenclature which have again been made. However, for these we must not blame the author of the book, who only has strictly adhered to the existing international rules of nomenclature which necessitate the great majority of his changes. But surely there must still be a great deal wrong with these rules which I, not pretending to be a taxonomist, can not judge. Who will not wring his hands in despair at such changes of well established names as *Pinus excelsa* becoming *P. Griffithii; Sequoia gigantea, Sequoiadendron giganteum; Sassafras officinale, S. albidum; Rosa Ecae, R. Primula; Stewartia pentagyna, S. ovata; Vaccinium pennsylvanicum, V. angustifolium* var. *laeviflorum.*

Perhaps even more deplorable are some cases where the same name applied in the old edition to one species is now transferred to another.

Cotoneaster rotundifolia Wall. of the old edition is now changed to *C. disticha,* while *Cotoneaster prostrata* Baker of the old edition is now *C. rotundifolia* Lindl. How very unfortunate! *Vitis cordifolia* Michx. of the old edition is now *V. vulpina* L., while the *Vitis vulpina* L. of the old edition is now called *V. riparia.* This apparently was a case of mistaken identity, but how sad!

Some consolation I found in the study of these changes by recognizing in certain of the new names old friends which I first learned to pronounce when I was a good deal younger. Professor Rehder simply returned to these names again, in most cases because of a recent change in the rules of nomenclature. Some of these names, by the way, remained in use

among practical horticulturists during the whole period while they were supposed to be superseded by others.

Some of these are:

Tilia americana for *T. glabra* of the old edition; *Camellia* for *Thea; Franklinia* for *Gordonia; Lindera* for *Benzoin; Carya tomentosa* for *C. alba; Gleditsia japonica* for *G. horrida;* and *Prunus Amygdalus* for *P. communis.*

I was particularly glad to see *Quercus rubra* L. of the old edition changed back to *Q. falcata* because of the confusion caused by the fact that *Quercus borealis* is much better known under its old name *Q. rubra.*

Let us hope that sometime in the future we shall reach some sort of stability in botanical nomenclature where changing of names will be reduced to an absolute minimum. In the meantime let us be grateful that we are not in the shoes of Professor Rehder, who, for the truly monumental work which he has done, is bound to earn a great deal of ingratitude and criticism because he had the strength of his convictions.

HENRY TEUSCHER,
Director of Technical Services,
Montreal Botanical Garden.

English Life and Gardens

GARDENS OF CHARACTER. Marion Cran. 284 pages, illustrated and indexed. Macmillan Co., New York. 1940. $3.

Mrs. Cran's Gardens of Character is full of lovely writing. One can visualize the homes of England as they were yesterday and one prays that "Coggers" has been spared. The book reflects the life behind the hedges and the whole philosophy and charm of country existence which was enacted therein. Living as described by Mrs. Cran is so inter-related with nature that the book is a garden full of memories and suggestions. This reader enjoyed the horticultural part, especially hearing of the vernal awakening in February (it always seems a miracle to us). The book tells of species unfamiliar to Americans, also of plants we know and like, such as yuccas. Some of us have seen them blooming in California canyons with *Sedum acre* as a ground cover; they are unforgettable.

Mrs. Cran is kindly too—she writes of our Concord grapes but never mentions how sour they are. Is she also prophetic when she asks, "With all the goodly Empire to settle in, why do we Britons stay in this inclement little island?" But we all trust they will and if they do they will appreciate it the more—horticulturists and others too.

HELEN SUZETTE DE GERSDORFF.

New Crops for the Far South

TROPICAL FRUITS FOR SOUTHERN FLORIDA AND CUBA AND THEIR USES. David Sturrock. 131 pages, indexed. Atkins Institution of Arnold Arboretum of Harvard University, Jamaica Plain, Mass. 1940. $1.50.

The author of this interesting book has been connected for several years with the problem of introduction and propagation of tropical fruits both in Florida and in Cuba.

On the first pages he points out the possibility of tropical fruits in Florida and the future industry that may be derived from the intensification of this crop. From pages 11 to 31 the reader will find a useful chapter concerning climate, culture, and diseases. The discussion of climatic factors is of much value for those who will make future plantations, especially in the southern part of Florida. The chapter concerning preserves, jams, jellies and pastes is very general but gives an idea of the technique to follow.

The main part of the book is a list of tropical fruits represented by 27 families and about 200 species. The most important ones are briefly described, not only a critical observation of their culture being given, but also the history of the plant, its introduction, possibility in different localities and comparative analysis from different countries where the plant is cultivated.

J. P. CARABIA.

Companionable Volume

SHRUBS IN THE GARDEN AND THEIR LEGENDS. Vernon Quinn. 308 pages, indexed. Illustrated by Marie A. Lawson. Frederick A. Stokes & Co., New York. 1940. $2.50.

A very friendly, pleasant book is Vernon Quinn's latest. It contains not a bit of the sugary sentimentality that used to spoil writings about flowers, but plenty of information that seems scientifically trustworthy is given in little stories or most surprising and charming quotations from the old herbalists and early

botanists. It is a book to pick up for a few minutes to put one in a pleasant mood; in short, a good companion.

Many of the woodcuts are highly decorative, and with the excellent printing make the book a fine one for a gift; also a worthy successor to the previous volumes by Vernon Quinn on seeds, leaves, and roots.

JULIA T. EMERSON.

An English Text in Biology

INTERMEDIATE BIOLOGY. W. F. Wheeler, 530 pages, illustrated and indexed. Chemical Publishing Co., New York. 1940. $6.

The elementary biology taught in our schools is mostly comparative morphology of animals: a heritage from the great days of Huxley and evolutionary theory. Though this textbook has the same bias, it allows plants more space and describes them more competently than is usual, and makes a distinct approach to a more modern, physiological point of view This is almost the first elementary text seen by this reviewer which recognizes that plants as well as animals use hormones and vitamins. That physiology still has to sneak in by the back door, however, is seen in the rather confused arrangement: plant growth substances are introduced under the head of "Irritability," and reappear in a chapter entitled "Hormones."

The chapter on evolution deals mainly with animals, as might be expected. The author reiterates as facts the still unproven assertions that the Bryophyta are "at a higher stage of evolutionary development than the Thallophyta," and that there has been "a gradual transition from Bryophyta to Angiospermae." It is characteristic of modern teaching that, clinging too lovingly to an evolutionary framework, it fails to keep evolution up to date.

As in many English textbooks, suggestions for laboratory exercises are included. Some (see, for instance, fig. 211) would unfortunately not prove what is intended. The book is designed for a more selected group of students than similar works in America. Certainly its terminology is too abundant, its discussions too condensed for most American undergraduates. It may, however, serve as a useful reference work, particularly for teachers.

H. W. RICKETT.

Japanese Gardens Portrayed By One Who Understands Them

THE ART OF JAPANESE GARDENS. Loraine E. Kuck, 304 pages, 67 illustrations. John Day Co., New York, 1940. $5.

It is refreshing to read a book on Japanese gardens which is not based upon the diagrams and formal rules given in the group of Japanese gardeners' manuals published at about the end of the eighteenth century and known to foreigners under the collective name "Secret Books and Oral Transmissions." In 1893 foreigners were introduced to these stylized plans and rules by Josiah Conder's monumental "Landscape Architecture of Japan." Following Conder, most later foreign authors have given plans for which only a single actual example* of garden in Japan is even remotely similar.

The present book gives with artistic feeling an adequate description of each of the famous state and temple gardens together with an interesting account of the history of both the designer and the man for whom each garden was constructed. In addition to the great landscape and stroll gardens of the nobility and priests, considerable attention has been given to the smaller gardens that follow the motifs of classic paintings, the monastic gardens designed to facilitate contemplation, the highly esthetic tea gardens, as well as the impressionistic modern and the back-yard gardens of city dwellers.

Miss Kuck is endowed with a high degree of esthetic appreciation, the power of vivid portrayal and an acute flair for discerning the non-obvious influences of history, changes of customs and modes of thought and living, on the development of art.

ERVIN S. FERRY.

Pacific Coast Gardening

SUNSET'S COMPLETE GARDEN BOOK. 223 pages, illustrated and indexed. Sunset Magazine, San Francisco. 1940. $1.

The western gardener is fortunate in having available such a convenient handbook. Most of the popular garden books and encyclopedias on gardening have been prepared primarily for the more

* The garden of the Tenryuji temple near Kyoto.

temperate parts of the United States and those regions where little winter gardening is possible. Consequently they are of little value in the Pacific West where gardening conditions are so different. And even in the Pacific West conditions vary, a fact recognized by the editors of this garden book, who have further separated the region into Pacific Northwest, Pacific Central and Pacific Southwest. The book contains discussions of garden plans and care, the growing of annuals, perennials, and shrubs, and special chapters on bulbs, tuberous-rooted plants, lawns and rock gardens.

There is a chapter on how to make garden furnishings. Of particular interest and value are month by month charts of "what to do" in the garden and the growing encyclopedia. The latter is an alphabetical index of the native and exotic plants most commonly used in the region with brief descriptions and notes on propagation and culture. Of course in a volume this size such a list cannot be complete. However, it is to be regretted that no mention is made of the use of some of the fine native plants such as the California redbud, the manzanitas, species of *Atriplex* and *Eriogonum,* the California laurel (*Umbellularia*), and *Calycanthus occidentalis.* In fact, a worthwhile addition to the volume would be a chapter devoted to the use of native plants, which so frequently are much more attractive and usable than the exotics.

MILDRED MATHIAS,
Berkeley, Calif.

This Gardener Knows How

BE YOUR OWN GARDENER. Sterling Patterson. 340 pages, illustrated and indexed. Harper & Brothers, New York. 1940. $2.50.

The writer took up this book with a little of the wearied feeling: "Here's another baby book"—the baby book being the characterization given by one of our best and most beloved gardeners to the endless stream of garden books written by those having little knowledge. Her percentage of the total, if I remember rightly, was 99%. They are the books which tell us that a biennial is a plant which produces its flowers the first year and its fruit the second and that one may plant lettuce outdoors with no protection in September and reap the salads thereof the following spring, or they may just wander along to tell of the author's none-too-interesting personal experiences after buying a farm or a suburban home.

This book happily turned out to be quite different. It is for beginners, as it means to be, but is written with a charm which will recommend it to more advanced gardeners. It is practical, simple and very helpful. It takes up design, situation, soils, lawns, flower borders, perennials, annuals and bulbs, evergreens, pools and rock work, garden equipment and a garden calendar, the usual subjects but all presented clearly and with much that is wise and useful.

Mr. Patterson knows what he is talking about, and his book is quotable. He undoubtedly has grown species tulips, for he says that they are "tough little customers and very intriguing." Also: "If you wish your early garden to be distinctive, may I suggest closer study of those back pages of bulb catalogs, usually headed 'Miscellaneous Bulbs'? Fewer tulips and fewer crocuses along with more camassias and chionodoxas and trout lilies," etc.—an inspiring list.

The following strikes a true note: "I sometimes wonder why anyone who has sufficiently mastered the rudiments to begin to use Professor Bailey's Standard Cyclopedia of Horticulture and his concise Hortus should ever buy another garden book. These volumes have everything but sex appeal. Yet, as I set down the words, sixteen other garden books eye me reproachfully and on my library shelves are many more to join them in resenting the calumny. In truth, I should not like to have foregone the experience of meeting any of them. Each gave me something of lasting value—in vicarious adventure, in stimulating viewpoint, in better understanding."

SARAH V. COOMBS.

Notes, News, and Comment

Registration. Sixty professional gardeners are registered this term in the Two-year Science Course offered on Monday evenings. In addition to the student gardeners at the Botanical Garden, the class includes employees of the New York City Park Department, professional gardeners who were registered last year in the Garden's practical course, and several employees of florists and nurserymen, as well as gardeners on

estates in and around New York. Some of the students come more than 60 miles to the class each week.

In the Two-year Course in Practical Gardening, which meets every Thursday evening, the final registration is close to 90. These students include a number of men and women aiming to develop their own home grounds, some professional gardeners and teachers, lawyers, lecturers, executives, and other business people for whom gardening is a hobby.

Art. Six hundred New York high school students, members of the School Art League, came to the New York Botanical Garden the morning of Oct. 5, to hear a lecture by Harold von Schmitt, President of the Society of Illustrators. Dr. William J. Robbins addressed the group informally on plants in their relation to art. A second visit to the Garden is planned for Oct. 19, when the group is to sketch scenes and flowers.

Visitors. Dr. M. M. Rhoades, who is succeeding Dr. Edmund W. Sinnott as Professor of Botany at Columbia University, visited the New York Botanical Garden with Dr. Th. Dobshansky, of the department of zoology at Columbia, Oct. 2.

Among the visitors during September were D. A. McLarty of Dartmouth College, Eva Lieberg of Westtown School in Pennsylvania; Carlos Muñoz of Santiago, Chile; Herbert Sterns, McGill University and the Botanical Garden in Montreal; Frank E. Egler, State School of Forestry, Syracuse; Fred M. Uber, University of Missouri; John J. Matter, Cleveland Garden Center; E. H. Walker, Smithsonian Institution; Edgar F. Wherry, University of Pennsylvania; Philip A. Chandler, Montreal Botanical Garden, with Mrs. Chandler; Vladimir C. Asmous, Arnold Arboretum; E. Vernon Watson, Royal Botanic Garden, Edinburgh; and L. E. Brass, American Museum of Natural History.

Student. Father Adam Zajdel of Baltimore, a graduate student in botany at Columbia, has come to the New York Botanical Garden to work toward his doctorate in taxonomy.

Sabbatical. Dr. Dorothy Day, Professor of Botany at Smith College, will spend her sabbatical year at the New York Botanical Garden doing research in Dr. Robbins' laboratory.

Curator. Dr. A. C. Smith left the New York Botanical Garden late in September to assume his new post as Curator of the Herbarium at the Arnold Arboretum, Jamaica Plain, Mass.

Erysimum. Dr. George B. Rossbach of Stanford University spent a week at the Botanical Garden in September working on the genus *Erysimum.*

Delegate. Dr. A. B. Stout was a delegate from the Botanical Garden to the Conference on Science, Philosophy, and Religion in Relation to the Democratic Way of Life, which was held in New York City Sept. 9-11.

Groups. Among the students who have been conducted on tours of the Garden in recent weeks are a group of 22 boys from Our Lady of Mercy School, who came to make a study of trees; 18 children and two teachers from Public School No. 50, who visited the Hemlock Grove and the grounds, and seven students from the Garden Club of Walton High School, with their teacher, who visited the outdoor flower displays.

Lectures. "The Value of Garden Literature" was the title of a lecture given by Elizabeth C. Hall before the North Suffolk Garden Club on Long Island Aug. 13. On Sept. 4, Dr. W. H. Camp spoke on "Native Plants for Natural Soils" before the Bedford Garden Club.

Diatom Gift. Samples of 43 diatoms found in the Florida peat deposits have been presented to the New York Botanical Garden by Herman Gunter, Florida State Geologist. These represent portions of the 42 numbered samples provided by the Florida State Geological Survey, which served as the basis of a paper written by Dr. G. Dallas Hanna of the California Academy of Sciences and published in the Florida Survey's report for 1930-32. The 43rd sample was later added to the collection.

Retired. Ludwig J. Manz, who had been a gardener in the Main Conservatories for the past twenty years, retired last month and is now living on Staten Island. He had been a gardener since 1882, when he began as an apprentice in the former arch-ducal botanical Garden in Salem, Baden, Germany. Later he worked in commercial establishments, then came to this country in 1892.

THE NEW YORK BOTANICAL GARDEN

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A. C. PFANDER .....*Assistant Superintendent*

To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by complete descriptions and other pertinent information.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays at the Garden from season to season.

(5) Credit, to the extent of the membership fee paid, toward courses of study offered by the Garden.

A limited number of Garden clubs are accepted as Affiliates. The privileges of affiliation are one lecture a year by a member of the staff, a share in the distribution of plants when they are available, a subscription to the Journal and to Addisonia, and announcements of special activities at the Botanical Garden. In addition, any member of an affiliated club may enroll in one of the Garden's study courses each year for one-half the regular fee.

Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

The classes of membership and types of benefaction are as follows:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Affiliation	annual fee for club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Contributions to the Garden may be deducted from taxable incomes. The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————————.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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OF

THE NEW YORK BOTANICAL GARDEN

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CAROL H. WOODWARD, Editor
November, 1940

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Cover Photograph by Fleda Griffith

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GARDENS IN WINTER

The opening of the Indoor Floral Display for the season in the Main Conservatories brings a new throng of visitors to the Garden every week-end to enjoy the thousands of flowering plants and ferns that are being shown under glass. The majority of these may be seen the year around, but the Indoor Floral Display is opened anew each November and from then until the end of May there is a continuous and ever-changing garden to be seen.

The Tropical Flower Garden has also been supplied with new material after being partly denuded during the summer. Now, just a year after it was originally opened, it presents a picture characteristically tropical in its luxuriance.

These two well designed gardens represent the current trend in presenting displays for the public's enjoyment. In years gone by, people visiting a conservatory filed past shelves and benches on which potted plants were set in rows. Today at the New York Botanical Garden they stroll through a pleasant garden on winding walks giving vistas down flower-bordered paths. There is no other place in New York where a continuous flower show may be seen the year around, and at times on Sundays and holidays the conservatories are not large enough to hold the crowds. But on weekdays many people are able to enjoy the garden scene from the comfort of a bench.

In neither the Floral Display House nor the Tropical Flower Garden is there a suggestion of potted plants being used, for the pots are all plunged in soil to give the illusion of a permanent outdoor garden. Yet nearly 500 pots of plants in full bloom were transported from Range 2, where they were grown, to Range 1, the Main Conservatories, prior to the opening of the Indoor Floral Display. And 350 additional pots of chrysanthemums were awaiting their turn to appear as soon as their buds were fully opened.

The year around, a crew of trained gardeners is kept busy growing new plants from seeds, cuttings, or bulbs to be displayed in the conservatories. Every few weeks they are able to produce an entirely new effect with the plants that they have recently brought into bloom. The visitor who comes once has by no means seen all. Many come week after week, and find new sights for their delight on every visit.

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Autumn In The Pine Barrens [1]

By Eleanor C. Marquand

IN the early autumn, after a few frosty nights, those who love the woods long to go down into the Pine Barrens of southeastern New Jersey to see what is left there of departing summer, and what changes the cold has brought. Although white men settled in this part of the state as much as 250 years ago, it is little known today. Most of the industries once established there have disappeared for one reason or another, so that this vast tract of some million and a quarter acres is today largely as it was when first discovered—a great expanse of pine and oak forests growing in sandy soil.

There are four state forests in the Pine Barrens—Lebanon, Penn, Bass River, and Green Bank, through which wind many miles of fine gravel roads. On Bear Swamp Hill in the Penn forest is a lookout with a view worth going many miles to see. In Bass River forest are interesting experimental plantations of European larch, Douglas-fir, Norway spruce, and five kinds of pines.

Those who go to the Pine Barrens at this season[2], will find the leaves of the southern red maples in the swamps as vivid a red as were their blossoms in April. The tupelos, too, will be turning by the watercourses,

[1] This article was originally prepared for a broadcast on the Radio Garden Club program over Station WOR and other stations of the Mutual Broadcasting System. It was to have been given on October 7, but was canceled because of the broadcasting of the World Series. It is being published here by permission of the Agricultural Extension Service of Rutgers University.

[2] Those who wish to picnic or camp in the Pine Barrens may eat by the roadside in many places or at a table under shelter and by a fire provided by the State Department of Conservation and Development. In Green Bank forest, by obtaining a permit, bathing (in season) and picnicking may be enjoyed. Public camp sites, picnic grounds and shelters, and cabins for family use are being constructed by CCC workers in Lebanon forest. At the Forestry Headquarters on Route S40, three-quarters of a mile east of Four Mile Circle, one can obtain, for a nominal sum, a permit for a fire in a picnic shelter or for setting up a camp at a camp site which is equipped with the necessities. Deep Hollow Pond is recommended as a camping site.

and the cranberry vines changing to dark red as their fruits take on their glowing crimson. Sumachs, poisonous or otherwise, are all beautiful in their autumn coloring. To escape painful experiences with poison sumach or its near relative, poison ivy, give a wide berth to shrubs and vines which bear small white fruits among their brilliant leaves. Blackberries and creeping dewberries, blueberries and huckleberries are over, but cranberries are good both to look at and to eat. The Indians taught our first settlers to eat blueberries and cranberries, and the latter were soon discovered to be a sovereign remedy for scurvy. Eagerly they were sought in boggy, marshy places, but it was not until 1835 that one Benjamin Thomas, living near Burr's Mills in Burlington County, had the ingenious idea of making a cranberry bog of his own. The important cranberry industries in South Jersey and on Cape Cod are the result of this experiment.

Bearberry, that very pretty, creeping evergreen plant which carpets many miles of the dwarf forests, is thick with rather dull red berries by October. With it one finds wintergreen, whose relatively large, bright scarlet fruits can occasionally be discovered even in May, apparently unchanged by the rigors of winter. Clambering over thickets will be the fox grape, its sweet purple or amber fruits delicately musky-flavored. By streams and ponds two near relatives of holly are in fruit, the evergreen inkberry, black-fruited, and deciduous winterberry, whose scarlet fruits are so widely used in Christmas decorations as to threaten this shrub with extermination.

Another plant associated with Christmas is mistletoe, which one occasionally finds growing on tupelos in swampy places. American holly, in all its glory of shining leaves and scarlet berries, grows near the coast from Maine to Florida. In late fall it is at its best along Barnegat Bay and on the sea-islands, where it is apt to be dwarfed by the wind but as thickly covered with scarlet fruit as are the bayberries with their gray-white fruits from which our ancestors made candles.

On the island dunes the grasses are heavy with seeds, and wild rose-bushes with red hips. This so-called Virginia rose, by the way, is said to have been the first American rose to be introduced across the Atlantic. How the Europeans must have enjoyed its sweet scent when it flowered for the first time in the seventeenth century gardens to which it was transported by explorers of the New World! Beach plums have practically disappeared from the dunes by October, though here and there a sheltered bush may still carry some of its juicy load. One may still have the surprise, too, of finding inch-long, purple-red fruits on low plants of the prickly-pear cactus. On the shores of Barnegat Bay, groundsel will be covered with silky white seed-clusters—at a little distance deceptively like blossoms. These are almost the only woody-stemmed Composites in this whole region, and they sometimes grow as much as 10 feet tall.

Back in the Pine Barrens once more, sharp eyes will discern those delicate white orchids known as ladies' tresses, because their spiral head of flowers suggests braided hair. Here and there will be a few last flower-clusters of orange milkwort, a purple spire of blazing star or occasional

The Pine Barren gentian, one of the loveliest of late autumn flowers in the sandy southern coastal region of New Jersey. (Photograph by courtesy of John Gill)

rosy-flowered gerardias. There will be an abundance of goldenrod, golden-asters, lavender asters on slender, wand-like stems, and white boneset, with occasionally the narrow-leaved perennial sunflower. Last, but certainly not least, are two flowers of outstanding charm—polygonella, a branching annual with minute white or rosy flowers which give it an exquisite, lace-like quality, and the Pine Barren gentian, to me the loveliest of all the lovely flowers of the region.

As one reluctantly turns homeward once more, it is worth while to notice Route 40, which leads one to and from the Pine Barrens, for it is a highway unlike any other in New Jersey. The whole 60 miles from Lakehurst to Camden are being transformed into a parkway appropriately planted mainly with native plant material, as a memorial to John D. Rockefeller, Sr.

Some day I hope to see a national park established near the state parks in the Pine Barrens to include the dwarf forests, bogs, and streams and the unspoiled bit of sea-island which is still available—a park like no other, which will preserve a unique section of the United States in its original beauty.

Members Granted Free Loan Of Lantern Slides

Garden's Large Collection Made Available As Additional Privilege of Membership

WITH the completion of the catalog of photographic prints and records of lantern slides in the Garden's files, as announced in the September number of the Journal, members of the New York Botanical Garden will be permitted to borrow slides to use in lectures. This arrangement gives members a privilege which they have not enjoyed before, and is provided in addition to their subscriptions to the Journal and Addisonia, personal cards announcing all lectures, special displays, and other events, a share of choice plants when they are being distributed, admission to courses of study without cost to the amount of the membership fee paid, use of the new members' room in the Museum Building, and other advantages.

Only those slides which are not being regularly used by staff members for lectures will be available, but with the Garden's collection of more than 13,000 selected slides, half of them colored, there will be found a wide range of subjects for which enough illustrations for a lecture can be provided.

Sets of slides on a given topic, such as trees or spring flowers, will be made up and shipped upon request so far as the supply permits.

Not more than 50 slides may be withdrawn by a person at any one time. They will be shipped collect, if requested, and must be returned prepaid. Suitable containers for shipping will be furnished upon request. Slides may be retained for one week. A charge of five cents a week for each slide retained longer will be made. Slides that are damaged beyond repair or are lost will be charged for at the rate of one dollar apiece if colored or 50 cents apiece if plain. If cover glasses are broken they will be charged for at 20 cents each.

Only members of the Garden will be permitted to borrow slides, and these must be selected from the collection as it stands. The catalogs from which the slides may be selected are in the library. Special slides can be prepared only as a personal purchase at the established rates. Mr. G. L. Wittrock has charge of all the loans, with the librarian taking charge on Saturdays.

Growing Ferns From Spores On Sterile Nutrient Media

By Clara S. Hires

THE spores of ferns are only about one-thousandth of an inch in length, yet under ideal conditions, each one of these has the potentiality of becoming a mature fern plant.

Ideal conditions, however, are not easy to provide. The very complex life cycle of ferns, as brought out by H. W. Rickett in this Journal for last March, is only one of numerous factors influencing successful reproduction. It is sufficient to recall here the speck-like beginning of a plant first produced by the spore, the gradual change from the spore to a prothallium, and the subsequent production of the sporophyte, which is the leafy portion of the fern. During the early stages, when the fern is exceedingly small and delicate, it must compete with invading microorganisms, algae, mosses, and liverworts. Fungi and insect pests which prevail or unfavorable conditions of moisture or light may destroy these minute plants. A healthy crop of prothallia or of young sporophytes may be killed almost overnight by disease or an unfavorable situation.

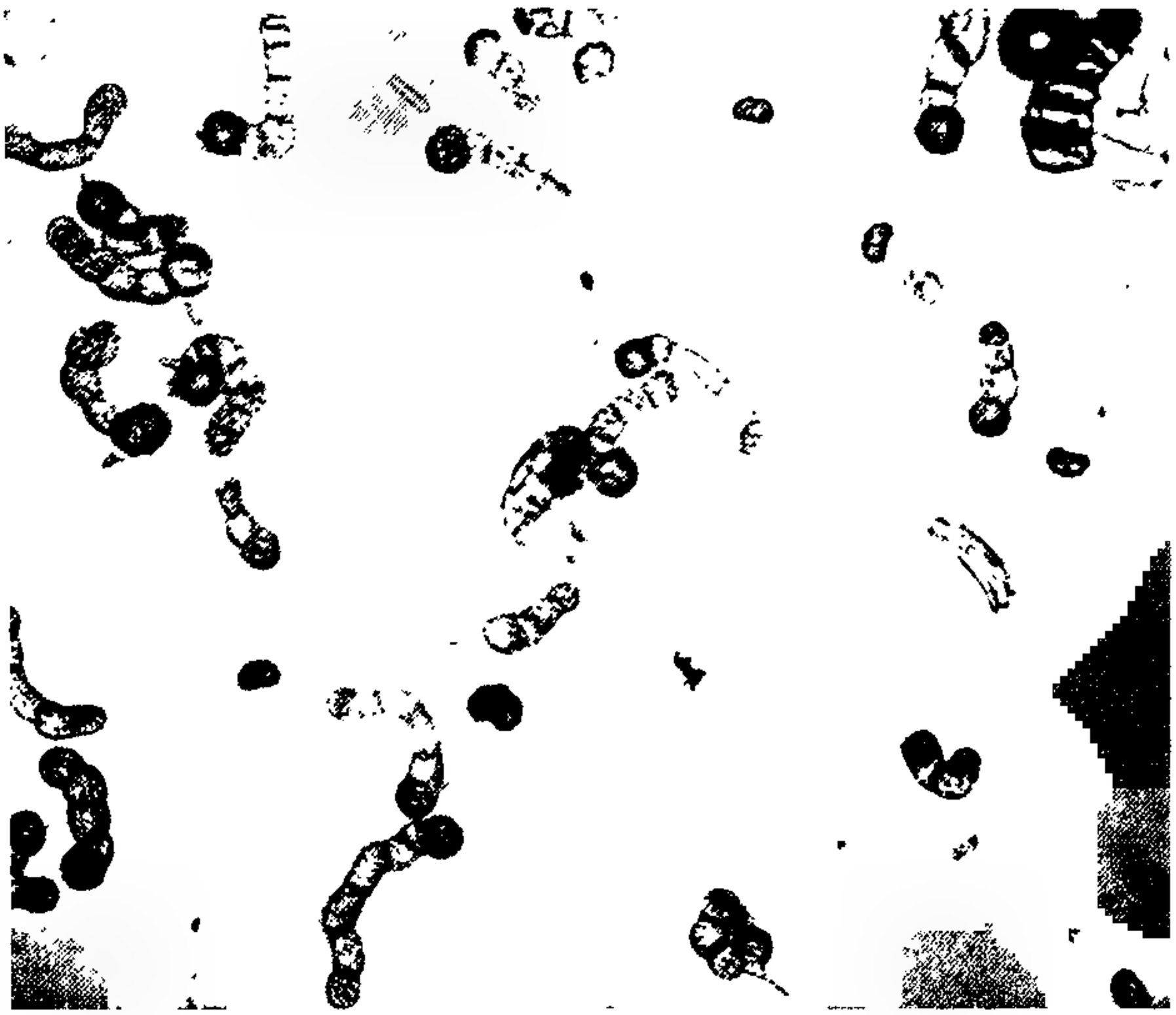
A knowledge of these factors and the elimination of such adverse conditions are essential to success, regardless of the method of fern culture used. A beginner, however, always expects to reach his goal immediately. The experienced grower knows that only years of study combined with trial and error will bring ultimate success.

Even in the best nurseries I had observed heavy losses in the production of ferns from spores. So, having previously worked at Cornell University with the pure culture method as applied to orchids, during the winter of 1929-30 I began to consider it possible to use the same technique on ferns. Gradually it became apparent that this method would be valuable for students of botany, for growers desiring a large and definite quantity of plants, and for conservationists aiming to repopulate areas from which the rarer ferns are being exterminated.

In evolving a method to use for ferns I had to learn not only of the problems of nutrition, but also of the important relationship of nutrition to light and other environmental factors. Now with the development of adequate nutrient solutions, light has become our problem of major importance. During the past ten years I have become increasingly convinced that the intelligent grower's inability to analyze and measure light accurately has not only been a major obstacle to the explanation of his success, but also has too often been a factor in his heavy losses.

The essence of the pure culture method is that the plant be grown in the entire absence of all other organisms. This is a purely artificial

Young sporophyte of Pol[illegible] elongated prothalliu

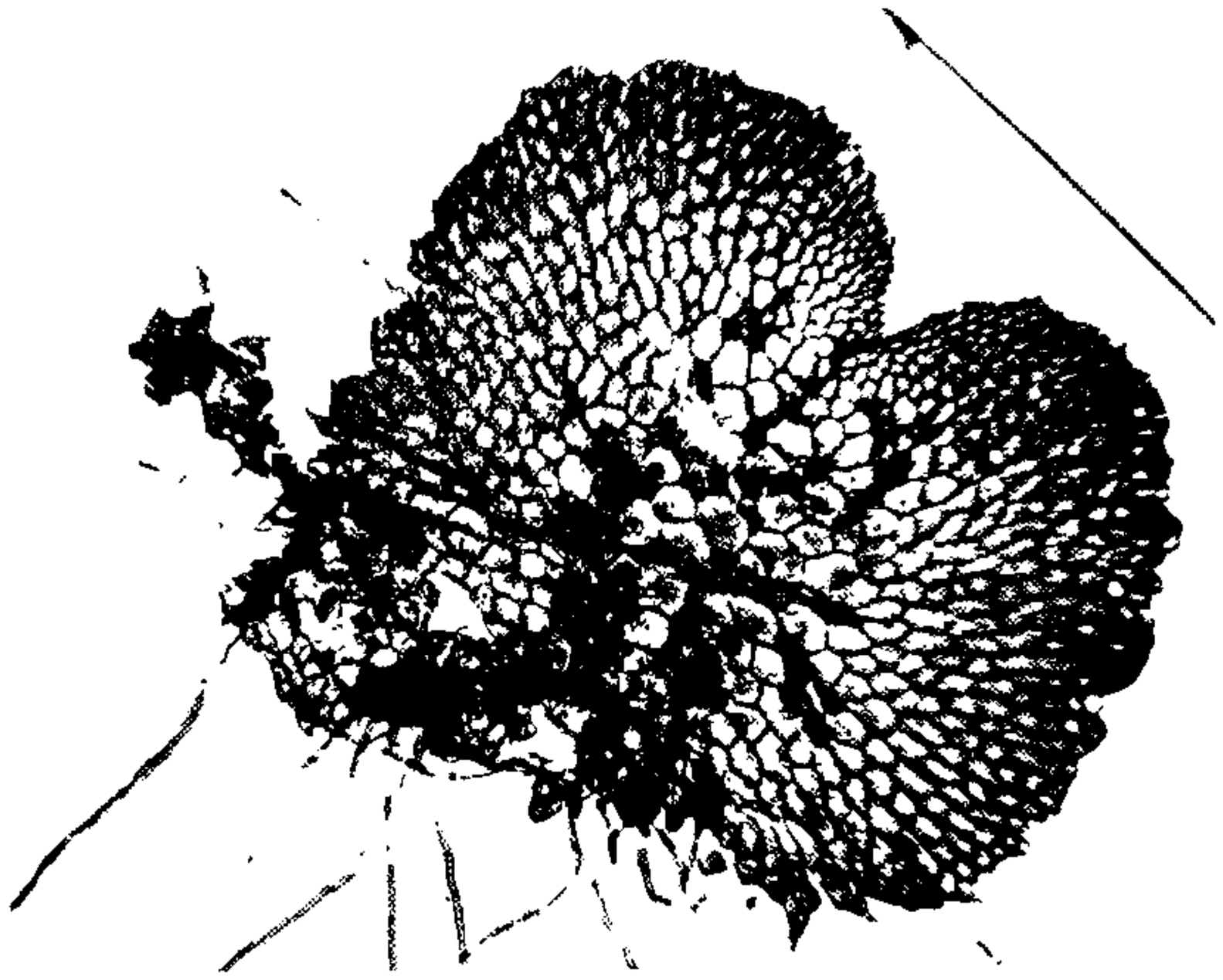


Spores of Polypodium aureum germinating. If the light is correct the cells divide quickly and a broad prothallum is formed.

method which permits complete control of all factors of nutrition and environment. It permits more accurate analysis of the causes of success or failure, and therefore makes possible a higher degree of perfection in results. But it must be remembered that success is not due to an adequate culture medium and technique alone; a proper environment is equally important.

The plants are grown in glass containers (tubes or flasks) on a nutrient solution composed of all the essential elements and mixed with agar. The best laboratory technique should be used in cleaning this glassware before the steam-sterilized solution is poured into it. The solution is similar to those used in the so-called chemical or soilless agriculture. When heated with the agar, the agar dissolves in it much as pectin does when used in making jellies. On cooling, the solution assumes a jelly-like consistency. The purpose of the agar is to make the solution firm enough to permit one to sow spores on the surface of the culture medium, to support the plants when they begin to grow, and to remain rigid during shipment by express or mail.

For heating the large flasks of nutrient solution mixed with agar and sterilizing them with steam, a large laundry boiler is practical. When the agar is dissolved a measured amount of the heated culture medium is poured into the thoroughly cleaned smaller tubes or flasks. The amount depends on the size and purpose of the container. Following this, the opening of the tube or flask is closed by a stopper of cotton, which permits interchange of air within the container and the air outside, but filters out

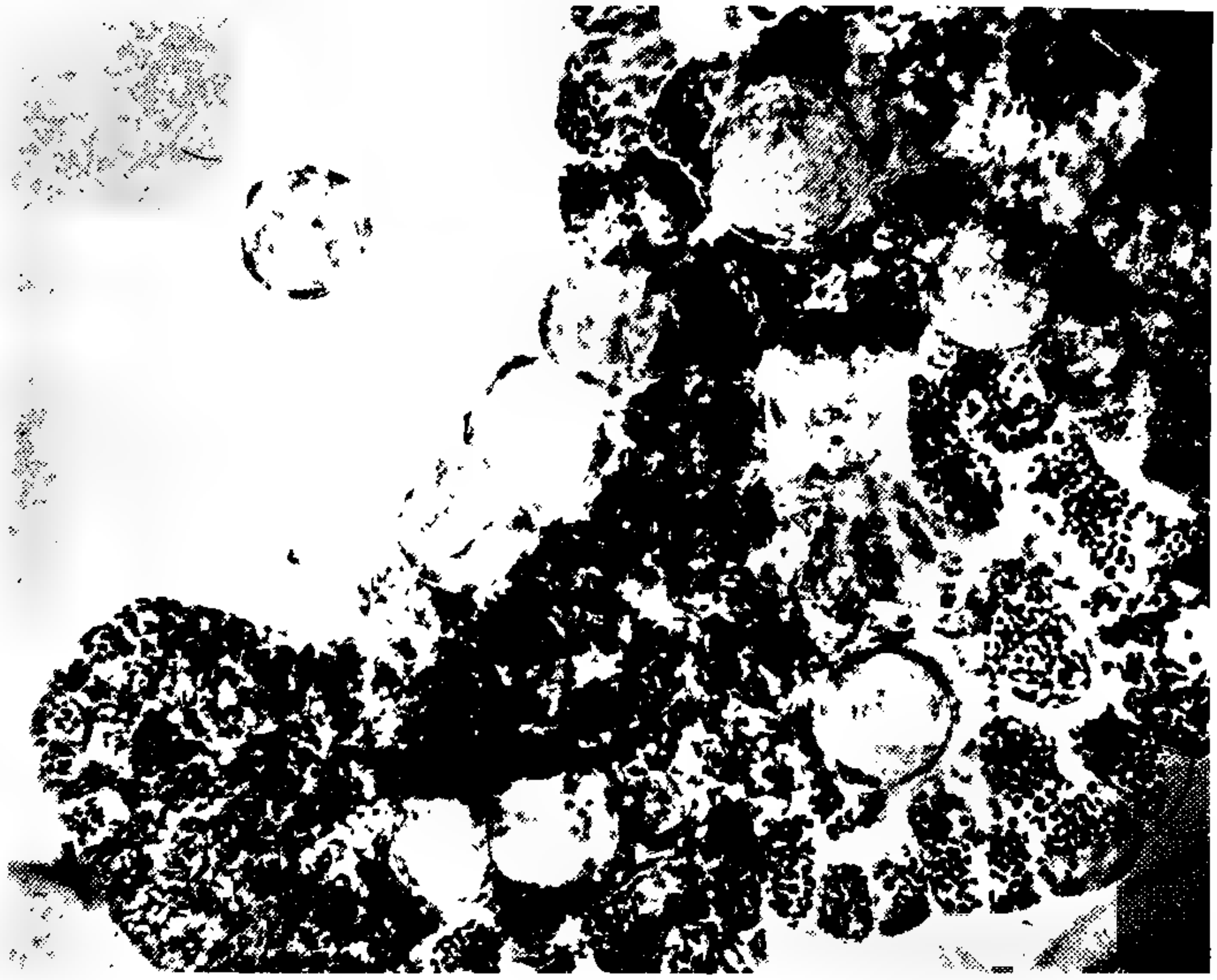


Under side of a prothallium of Polypodium aureum. The darker cells under the notch or among the rhizoids of such heart-shaped prothallia usually indicate reproductive organs.
(Magnified 30 diameters)

micro-organisms if the cotton is kept dry. After the tubes and flasks have been provided with the cotton stoppers, they are sterilized by steam to kill all organisms in the culture medium and cotton. The time of sterilization depends on the pressure of steam, on the number and size of the tubes or flasks to be sterilized, and on the materials used in the nutrient solution. When the tubes have been sterilized, they are placed to harden in such a position that the surface will slope. This is essentially the method used in bacteriology, and a knowledge of bacteriological technique is necessary for success.

Preventing contamination is a matter of care with every detail. Solution allowed to boil up on the stopper, or water dropped on the outside, will permit micro-organisms to grow through the stopper. The vapor is harmless on the stoppers, if allowed to dry quickly. There are innumer-

The laboratory greenhouse at Millburn, N. J., where the author is growing ferns and other plant materials on sterile nutrient media under highly controlled conditions.



Mature antheridia, one of them detached from a portion of a prothallium of Lygodium palmatum. (*Magnified 212 diameters*)

able little details that would need to be mentioned if the worker does not understand the behavior of the micro-organisms that fill the air.

It should be obvious that if the culture medium and container must be sterilized, the spores must also be free of micro-organisms. This can not be done by heat, since the spores themselves would be killed. To free the spores of micro-organisms they are placed in a small test tube to which is added a solution of chloride of lime as described by J. K. Wilson in the *American Journal of Botany* for 1915 (pages 420-427). The tube is then closed with a cork and the tube is shaken, usually by hand, until each spore becomes thoroughly wetted. The time for treatment depends in part on the amount of foreign material mixed with the spores. Usually a thirty-minute treatment is sufficient for clean spores. By adapting a massage vibrator to the purpose, tubes with spores can be automatically shaken for the entire period. The degree of agitation is controlled by a rheostat. Constant agitation, providing better aeration, seems to improve germination, as well as sterilization. Too long sterilizing decreases or destroys the vitality of the spores.

In sowing the spores a looped platinum wire is used such as is commonly employed in bacteriology. The spores generally rise to the surface, and the desired quantity may be picked up by the wire. They are then spread over the surface of the agar. In removing the cotton stopper to permit sowing of the spores and in all other operations involved, care must be observed to prevent the entrance of micro-organisms into the container. The work should be done as quickly as possible, with the opening held near a flame.

Most fern spores will not germinate in darkness. Usually I use a light intensity of from 10 to 50 foot candle power, depending on the species to be germinated. The greenhouse temperature is controlled for 65° to 85° F. As soon as a green growth appears on the surface, the light intensity, which is measured with photo-electric cells and a recording light meter, is then increased to 50—75 foot candle power. From this point it is gradually increased to about 150 foot candles until the reproductive organs are formed. Ferns vary markedly in relation to light in-

The same picture shown on the preceding page, enlarged 400 diameters to show the antherozoids discharged from the mature antheridium that has broken loose.

The protonema-like growth of the prothallia of Cibotium Scheidii caused by insufficient light.
(Magnified 86 diameters)

tensity. *Cibotium Schcidci*, for example, may remain entirely in a protonemal stage when other ferns are producing good prothallia. If the light intensity is increased soon enough, Cibotium again develops heart-shaped prothallia. This is true of other ferns, such as Lygodium, the climbing fern. Too much light may make them coarse and ribbony in the early stage. These structures may however produce sporophytes, while the protonema-like growth will not. The light intensities referred to here are under usual greenhouse conditions, where the amount is cut down or made indirect by paint, cheesecloth or muslin.

The development of sex organs in ferns is determined by the intensity of light. But reproduction can not occur unless the male gamete reaches the egg cell. To insure fertilization a small amount of water is siphoned down to the culture vessel from a large flask under sterile conditions. This releases the antherozoids and enables some of them to reach the archegonia and egg cells of the prothallia. After the fertilization of the egg cell the sporophyte is produced. Sporophytes may be observed within a month after adding the water. In certain ferns, such as Pteris, development of sporophytes commonly occurs without sexual reproduction. In fact, they may grow from the vegetative tissue of the prothallium; that is, they are produced apogamously. Also at times a sporophyte leaf resting in moisture against the agar sends out new sporophytes. This is known as apospory and happens occasionally with *Polypodium aurcum*.

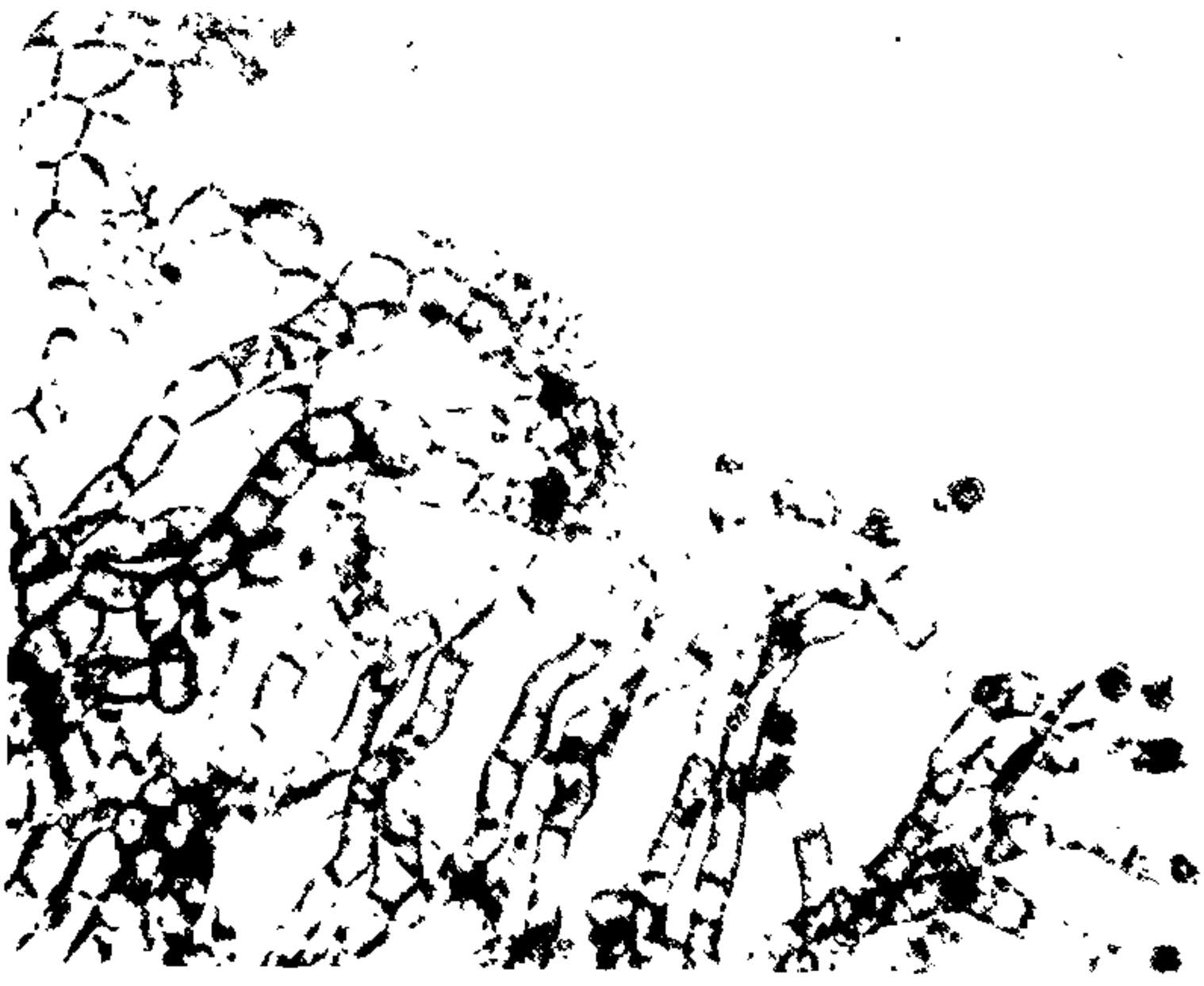
The problem of light in relation to development is still being studied. An interesting observation is that green fluorescent light, combined with dim normal light or some daylight fluorescent, is conducive to the formation of fine heart-shaped prothallia. Special glass, such as Solex, which cuts out infra-red as well as ultra-violet, seems to show promise for ferns.

When the sporophytes are produced the light intensity may be increased

New prothallia starting from an older, heart-shaped prothallium of Polypodium aureum. (Magnified 35 diameters) Many new plants may be obtained vegetatively in this manner.

to about 250—400 foot candle power, but at no time can the tube or flask be exposed to direct light. Even though faint, direct sunlight results in an increased temperature within the tube, and death of the plant may occur.

Germination of fern spores in pure cultures is practically 100 per cent. All prothallia survive and may even multiply vegetatively. Thus from a single prothallium of maidenhair spleenwort I have obtained many thousands of prothallia. When the sporophytes are formed, they may



Vegetative proliferation of fern prothallium, greatly magnified, showing the chains of cells which are growing outward, some of them already broadening into prothallium-like structures.

be removed without endangering the prothallia which are still present. Such sporophytes may be transplanted to the desired potting material. The older and larger the sporophyte the better, of course, the chance of its survival.

Besides their practical value for growers, these pure cultures of ferns have particular advantages in the teaching of courses in botany or biology. The student may observe readily the entire development of the fern and the prothallia completely free of foreign matter. They are especially suitable for microscopic observation.

The grower, whether he wishes ferns for a hobby, for profit, or for conservation, will find the pure culture method, when used with care, a reliable source for healthy ferns in large quantities.

First Motion Picture of Garden, Also New Members' Room, Make Initial Appearances

THE first motion picture in color taken by Fleda Griffith with the Garden's new motion picture camera had its initial showing at a meeting of the Board of Managers the evening of Oct. 10 at the home of President Joseph R. Swan. The picture provides a year-around tour of the grounds and greenhouses, with a glimpse of the library, of some of the work at Range 2 in preparation for exhibits, and of such operations as spraying, lawn-making, and planting shrubs. Much more will be added to the film as time and funds permit, and when it is more complete it will be shown in public.

It was presented a second time at a meeting of the Advisory Council Oct. 31, when the new Members' Room was opened on the third floor of the Museum Building. The Advisory Council has provided the furnishings for the room, which has been designed for members to use for conferences, meetings, teas, or as a reading room while they are working in the library. It will be open the same hours as the rest of the building: from 10 a.m. to 4:30 p.m. beginning Nov. 1 and until 5 p.m. beginning March 1.

Indoor Floral Display Opens For The Season

CHRYSANTHEMUMS are the feature of the first Indoor Floral Display of the 1940-41 season, which opened Nov. 1 in the Main Conservatories. This date marked the beginning of an ever-changing flower show which will be continued through May. As new plants come into bloom week after week in the Garden's greenhouses, they will be added to the display. Every few weeks a complete new scene will be created.

This year a new design has been carried out for the indoor garden where the winter floral display is staged. Tanbark paths separate the beds of bloom and a fountain plays at one end of the main path. The great banyan tree, which has been called the world's finest specimen grown under glass, forms a focal point for one part of the exhibit, and creates a background for an informal grouping of plants around a grass plot. About 350 pots of chrysanthemums, besides other flowers, comprised the opening display, and as many more were expected to be added the first month. A special Christmas display will follow.

Benches are provided both here and in the Tropical Flower Garden for the comfort of visitors.

Yellow Pines And Other Conifers Observed In Lower California

By Ira L. Wiggins
Dudley Herbarium
Stanford University

IN the September Journal an outline was given of the expeditions in Lower California undertaken by Dr. Ira L. Wiggins of Stanford University, and a number of the strange plants encountered there were described. In the accompanying article Dr. Wiggins writes about some of the conifers of the peninsula and of a botanical problem among the pines which he set out to solve.—C.H.W.

THE flora in the northern part of Lower California is practically the same as that in the adjacent part of the States, differing mainly in the loss of certain characteristic species of the north and an equally gradual addition of new species as one travels southward.

In inaugurating a series of expeditions into Lower California,[1] one of the first questions decided upon for investigation involved the identity of the yellow pine known to grow in the Sierra San Pedro Martír.

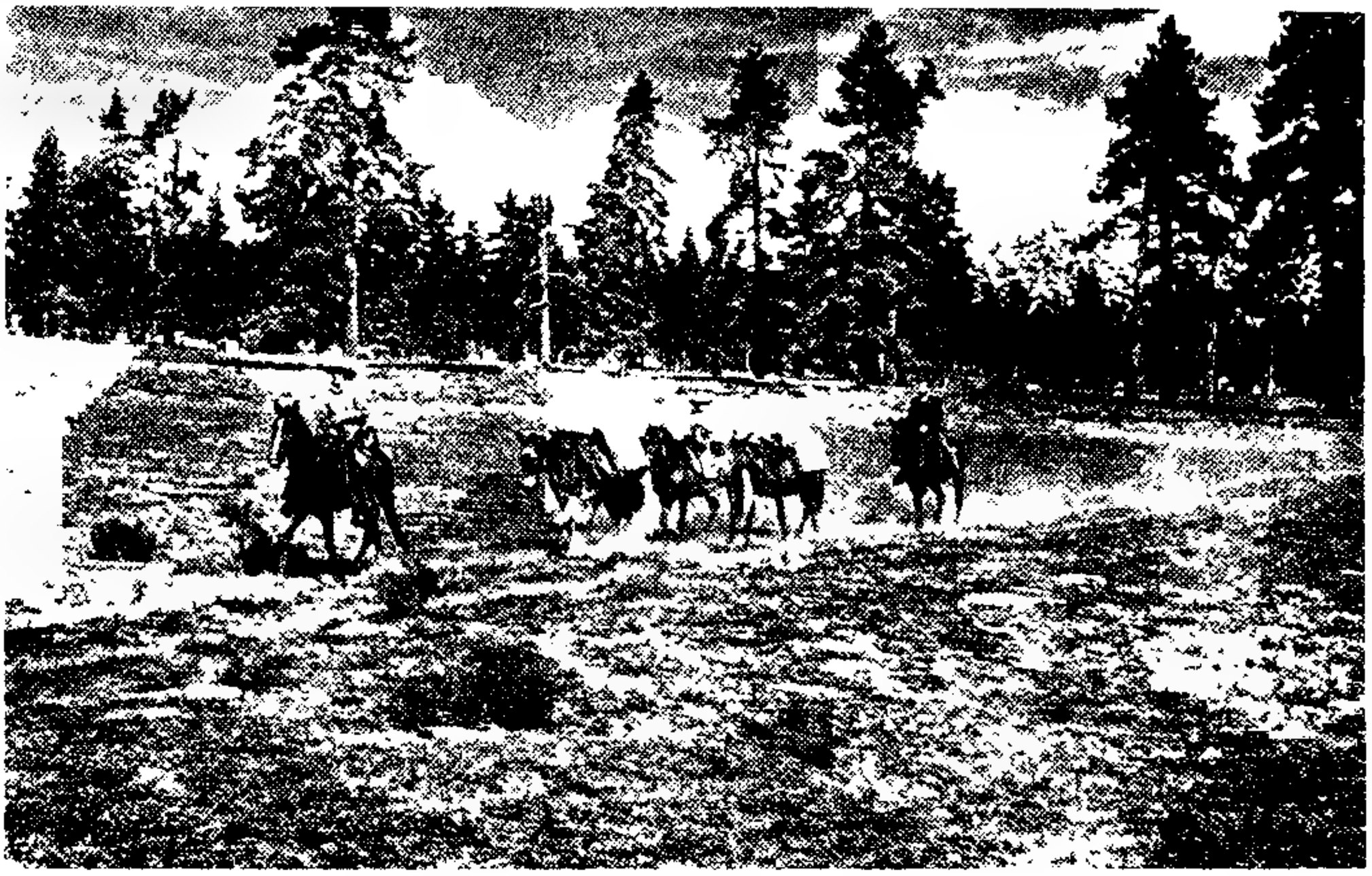
In the Sierra Nevada of California there are two economically important yellow pines, *Pinus ponderosa* and *Pinus Jeffreyi*, the latter often relegated to varietal rank under the former. In this northern area *P. ponderosa* occurs mainly in the Arid Transition zone, while *P. Jeffreyi* grows at somewhat higher altitudes in the uppermost parts of the Arid Transition and in the Canadian zone. In some Californian areas the two are distinctly different in appearance, *P Jeffreyi* possessing darker bark, larger cones, a more bluish cast of the needles, glaucous bark on the vigorously growing young shoots, and a characteristic delicate fragrance in the inner bark. In other northern regions the two intergrade to such an extent that it is extremely difficult to distinguish between them. In the Sierra Nevada the Jeffrey pine usually grows above 6,000 feet, with *P. pondcrosa* occurring as low as 3,000 feet and from there upward to the zone of contact between it and *P. Jeffreyi.*

But as the yellow pines are examined at successively more southern locations, one finds that there is a decided tendency for the Jeffrey pine to grow lower and lower on the mountain slopes and to replace *P. ponderosa*, even at the lower elevations. In San Diego County there seems to be about an equal number of the large-coned trees commonly considered *P. Jeffreyi*, and the smaller-coned *P ponderosa* with non-glaucous bark on the young branches.

Then, as one investigates the yellow pines in the Sierra Juarez and the Sierra San Pedro Martír, the number of small-coned, light barked trees diminishes almost to the vanishing point. On the western flanks of the

[1] For a map of these expeditions see page 204 of this Journal for September 1940.

Sierra San Pedro Martír straggling colonies and isolated specimens of yellow pine appear at an elevation of about 3,000 feet above sea level and gradually increase in number until extensive stands cover thousands of acres at elevations of from 6,000 to 8,000 feet. Practically every specimen in this region, be it among the isolated individuals at low altitudes or in the forests higher up, shows the characters of the Sierra



Packing out from La Encantada in the Sierra San Pedro Martír. Pinus Jeffreyi is the conifer forming the background of the scene.

Nevadan Jeffrey pine. The cones of most of the Lower Californian specimens are 6 to 7 inches high, have the same orange-brown color and the sharply recurved prickles at the ends of the cone-scales as those shown by the cones of *P. Jeffreyi* from more northern localities. The bark of the young growth is glaucous-orange, the needles blue-green, and the bruised bark has the delicate vanilla-like fragrance. On the basis of field observations, comparison of herbarium specimens, and kodachrome slides it seems clear to me that the yellow pine of Baja California is *Pinus Jeffreyi*. A quantity of seed of this pine collected in September, 1938, has been turned over to the Institute of Forest Genetics at Placerville, Calif. It is hoped that trees raised from this seed may, during the course of a few years, definitely establish the taxonomic and genetic status of the Lower Californian yellow pine.

Pinus quadrifolia is abundant throughout the Sierra Pinál (a gently sloping range lying east of and parallel to the Sierra Juarez) and below

the Jeffrey pine belt along the northwestern and western slopes of the Sierra San Pedro Martír. *Pinus monophylla,* another of the piñon pines, is less abundant than the four-leaved pine, but occurs in small scattered stands along the dry ridges leading down from the north end of the Sierra San Pedro Martír to Valle de la Trínidad. The seeds of both species are gathered for food by the Mexicans and Indians of the region, a certain quantity of these seeds reaching the markets in Ensenada, Mexicali, and Tia Juana during years of good seed production.

Libocedrus decurrens grows in most of the canyons where running water occurs, occasionally descending below 3,000 feet. For example, it is present in small numbers along the banks of El Rio Santo Domingo near San Antonio, at an altitude of about 2,100 feet. A number of small trees grow in the canyon about a quarter of a mile above the ruins of the Mission of San Pedro Martír, at an altitude of 4,860 feet. This is probably the most southerly station for the incense cedar on the peninsula.

Juniperus californica is common on arid plateaus and dry ridges in the Upper Sonoran zone of the interior regions in southern California and southward into northern Lower California. Splendid "forests" of the California juniper occur on the flats between Rancho Viejo and Valle de la Trínidad. For a distance of eight or ten miles between these two places it is the principal shrub, at some points the only one. Nowhere else have I seen more symmetrical or healthier specimens. Many of the shrubs in this region were fruiting heavily in October, 1938, the glaucous berries giving such specimens a decided bluish cast. Similar stands occur in nearly all of the broad interior mountain valleys at moderate elevations in the Sierra Juarez. South of Valle de la Trínidad, in the foothills of the Sierra San Pedro Martír, specimens become successively less numerous, and here the juniper usually grows as a minor element among other chaparral species. This straggling of species, normally found in the Upper Sonoran zone, into the desert, and the gradual transition from the Upper Sonoran to the Lower Sonoran zone has been admirably described by Shreve.[2]

Rarely does the California juniper drop into the Lower Sonoran zone, but on the red clay hills between Rosario and San Fernando, at an elevation of about 1,800 feet, a lone specimen grows in association with *Idria columnaris, Agave Nelsonii, Agave serrulata, Pachycereus Pringlei, Acacia Greggii, Laraca tridentata,* and *Fouquieria splendens,*[3] desert dwellers all.

[2] Shreve, Forrest. The Transition from Desert to Chaparral in Baja California. Madroño **3**: 257-264. 1936.

[3] For illustrations of some of these plants, see the September Journal.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

A Stimulating Background for Students in Gardening

TEXTBOOK OF GENERAL HORTICULTURE. Julian C. Schilletter and Harry W. Richey. 367 pages, illustrated, indexed. McGraw-Hill Co., New York. 1940. $3.

The need for a textbook of general horticulture as an introduction to the field of horticulture has long been evident. Messrs. Schilletter and Richey state that the object of their book is "to set forth the essential principles of horticulture in a manner suitable for a general introductory college course." After proceeding courageously and efficiently to view the picture as a whole, they gradually, as under a high-power microscope, pick out some of the endless details which, when assembled, create the complete picture of general horticulture.

The content covers a wide range of studies and practices and, proceeding logically from horticulture as one broad group in agriculture, develops the concept of horticulture as both an art and a science and deals with it in the basic divisions of the trade and in botanical relationships. Following this substantial foundation, the reader explores the horticultural enterprises of the world, the United States, and the home, including horticultural production "for optimum benefits to mankind," physiographical distribution of products, factors influencing commercial enterprises in production and the utilization of the products by the individual family.

The second part of the book concerns itself with structures, functions and growth of horticultural plants and their relationships to temperature, moisture, light and soil. The information covering these fundamental facts is basic and prepares the way for the chapters which follow. Here the reasons for performing horticultural practices are stressed and supported by methods in many instances. Application of the principles and consideration of other factors are discussed in relation to propagation, soil management, training of plants, pruning, and pest control. Harvesting and storing of products completes the chapters of the book.

The entire text is well fortified with comprehensive charts, tables, pictures, and drawings as illustrative material. At the end of each chapter are numerous review questions, problems and suggested collateral readings—on the whole a stimulating help.

Despite the authors' statements in the preface, many specialists in plant science, soil technology, botany, landscape gardening, and others, will point out shortcomings. In order that the little knowledge does not become the ultimate to the student and, therefore, more a detriment than a help and incentive, it will be well for all teachers to put great stress upon the wise counsel of Messrs. Schilletter and Richey.

This text used properly will give a student a fine background and should awaken a potential interest in a specialized field. The book should serve its purpose well.

CARL F. WEDELL,
State Institute of Applied Agriculture, Farmingdale, Long Island.

Handbook of Hepatics

A MANUAL OF THE LIVERWORTS OF WEST VIRGINIA. Nelle Ammons. 164 pages, illustrated with 26 plates, indexed. University Press, Notre Dame, Indiana. 1940. $1.75.

The study of liverworts in North America has at times been discouraging to the professional as well as the amateur, because of a lack of well-illustrated, comprehensive manuals. Dr. Ammons' work remedies this situation not only for West Virginia but much of northeastern North America, inasmuch as West Virginia has an extensive hepatic flora (112 species) because of its mountainous terrain.

Although reproductive structures are not ignored, emphasis is placed on the omnipresent vegetative structures in both keys and descriptions. Diagnosis is made

easy by 26 plates of line drawings. All species are illustrated; habit sketches are made at the same (3X) magnification and diagnostic parts are depicted at higher diameters.

The classification follows that proposed by Evans (1939) and the nomenclature agrees with the recent checklist by Buch, Evans and Verdoorn (1937).

Other features of interest are the explanation of scientific names, the glossary and an extensive bibliography. The manual should prove popular with both students and amateurs in the field and laboratory.

It is hoped that it is a prelude to an equivalent work by Dr. Ammons on the mosses of West Virginia.

A. J. SHARP,
University of Tennessee.

The Art of Bonsai

DWARF TREES. Shinobu Nozaki. 74 pages text, 115 full-page plates, 2 appendixes. Distributed in America by G. E. Stechert Co., New York, 1940. $4.50.

So many books have been written lately on Japanese flower arrangements, that it is refreshing to read of the cultural skill that the Japanese possess in training trees to beautiful shapes and lines which we so often admire. In my travels I was fortunate to work in a European nursery with two Japanese, whose patience, skill, and untiring efforts produced specimens of the dwarfed type of coniferous and deciduous trees.

Dwarf Trees ("Bonsai") is a book of great beauty and a distinguished addition to the few volumes published on the subject.

The one hundred and seventeen plates picture "Bonsai" from 8 to 40 inches in height in suitable containers on ornamental stands. The plant material belongs mostly to the Rose, Heather, and Pine Family; Black Pine, Japanese Cedar and Junipers are the most fashionable "Bonsai".

A splendid example of the art is "Old Goyo Matsu" which has the rugged beauty of an old mountain tree and is considered to be 400 years old. Culture, training and fertilization are thoroughly discussed by the author, who claims that there is no secret involved in keeping these lovely artistic creations in growing condition.

According to Nozaki there are about 300 "Bonsai" dealers in Tokio, which speaks for the popularity of dwarf trees in Japan. Considering the years of labor, some of the specimens are highly prized and very much in demand by collectors. The cheaper kinds are bought by the public to decorate the house for New Year (an old Japanese custom) or given as gifts.

Dwarf Trees will give many a reader inspiration to try the art of "Bonsai".

ANTHONY E. SAILER,
Head Gardener for
Mrs. W. Redmond Cross,
Bernardsville, N. J.

Hormones, Eugenics, and Other Genetic Problems

PRINCIPLES OF GENETICS. E. Grace White. 352 pages, illustrated and indexed. C. V. Mosby Co., St. Louis, Mo. 1940. $2.50.

This is a text designed for the average student of genetics. The 352 pages of subject matter are divided into twenty-one chapters covering the main topics of importance to the subject. There are chapters on the more recent developments such as in Induced Mutations, Hormone Influence, Chromosome Maps, Hormone Inheritance and Eugenics.

A. B. STOUT.

Color Photographs Illustrating Principles of Arrangement

FLOWER ARRANGEMENT IN COLOR. F. F. Rockwell and Esther C. Grayson. 237 pages, 61 natural color photographs. Wm. H. Wise & Co., New York. 1940. $2.95.

This will prove a useful book especially for the novice, for the color helps to show up the balance and accent in the arrangements. But like all illustrations made from direct color photography, they are not absolutely accurate, especially in the blues and greens. It is a pity that many of the pictures were not also done in black and white to bring out more clearly the relations of line and mass in the designs.

The book, although a small one covering only a part of all flower arrangement, is comprehensive and clear so far as it goes, and the chapter on Do's and Don't's is very good indeed. However, I feel forced to quarrel with the statement on page 4 that, "The turning point between the old-time, more or less hap-

hazard bouquet and what is now connoted by the term 'arrangement' can be set just after John Taylor Arms was asked to judge arrangements at the International Flower Show several years ago." How anyone can scrap the background work done by Professor E. S. White of Cornell and many other devoted workers, writers, and lecturers is rather startling, especially as Mr. Arms himself lectured on Design in Flower Arrangement a number of years ago. This reviewer lectured in the same courses with him many times. Mr. Arms only stressed the principles that were already well known, and never pretended to be doing anything original. The basis for his illustrations in these lectures consisted of pictures made a good many years ago, and quite famous too, by such exponents of design as Van Gogh, Gauguin and others. And before them the same principles went back many hundreds of years. The authors were rather "snap" in this judgment, though they have been careful in other directions and have produced a book that puts the principles of flower arrangement in a form that is easy to understand.

ETHEL ANSON S. PECKHAM.

Some Arguments On Carpel Theories

FLORAL MORPHOLOGY. Volume I. E. R. Saunders. 132 pages. Illustrated and indexed. Chemical Publishing Co., New York, 1937. $1.50.

FLORAL MORPHOLOGY. Volume II. E. R. Saunders 609 pages. Illustrated and indexed. W. Heffer & Sons, Ltd., Cambridge, Eng. 1939. 10/6. Distributed in America by the Chemical Publishing Co., N. Y. $4.25.

The title of this work is misleading; it is not a general treatment of floral morphology. Its purpose is to summarize Miss Saunders' long series of papers and to present her ideas. "It appeared to me that the end in view would be most satisfactorily attained if I confined myself to such data as were directly or indirectly relevant to the new viewpoint, leaving the readers to acquire other information from existing works on systematic botany."

Volume I appeared in 1937. It included, as Part 1, 25 pages of introductory discussion and references to 30 papers by Miss Saunders; and, in Parts 2, 3, and 4, descriptions of selected types in many families. Volume II, which completes the work after a lapse of two years, has two pages of discussion, a list of references which includes those in Volume I and 4 additional ones, and, in Parts 5-16, many more descriptions of floral types. In all, 190 families are treated, each including several genera and species. The families are arranged in no systematic order. The work is illustrated by 48 figures, almost all in Volume II (figs. 39-48 illustrate families described in Volume I but are printed in Volume II). At the end of Volume II is an index to the entire work, and an appendix which reproduces the author's exhibit at a meeting of the British Association for the Advancement of Science, entitled *A Century's Challenge to Orthodoxy*.

Miss Saunders' theories have undergone a considerable evolution since the original announcement of "carpel polymorphism." The idea that the crucifer pistil is composed of 4 carpels, of which 2 are "valves" and 2 "solid," has been accepted by many. The postulation of similar conditions in pistils generally, while it seemed to offer an explanation of many morphological puzzles, has been too much for the average botanist to swallow. Moreover Miss Saunders has progressed outwards from the carpels to a general discussion of floral symmetry, and the doctrine that was first only an explanation of a type of pistil is now a panacea for all the ills of morphology.

The anatomical facts adduced in Miss Saunders' many papers are not in themselves new; the novelty of her doctrine derives rather from the axioms on which her concept of morphology is based. One of these is that "the fundamental feature of the whole vascular scheme is the departure from the central axial cylinder of bundles corresponding in number and in their radial disposition with the number and arrangement of the floral members." Since, however, it is admitted that more than one bundle may actually enter a floral member and that these may depart from the stele as separate traces, the value of the principle as a guide to specific structure is questionable. The orientation of bundles is nowhere figured or mentioned, and those which are usually interpreted as the inverted ventral bundles of a carpel are as likely as others to be "midrib bundles" and to determine carpels. Valve carpels are said to have "lateral" veins which branch pinnately from the

midrib. Solid carpels may have no midrib and a pair of "laterals" (sometimes arranged radially). The variety of forms assumed by these carpels justifies the term polymorphism, and Miss Saunders' methods of determining the limits of individual carpels remain a mystery.

Another postulate fundamental to the doctrine is that a floral part cannot receive bundles from opposite sides of the stele. This leads to a bicarpellary explanation of a legume and of the drupe of *Prunus* (though the drupelet of *Rubus* is described as monocarpellary). The follicle of Ranunculaceae is likewise to be regarded as "pseudoapocarpous" and to consist of a sterile carpel united with two halves of neighboring (split) fertile carpels. For a theory which was to simplify floral structure this is disappointing! One of the appealing features of the original theory was its claim to explain the old trouble of the commissural stigma. But since the hitherto inoffensive stigma of *Actaea* and other genera now is to be made of the tip of one carpel united with half-portions of 2 others, the old difficulties seem preferable. Eames has exposed the falsity of the postulate which underlies this morphological chaos.

The "vascular ground plan" is held to be more fundamental than the floral plan and to demonstrate more clearly the general tendency towards alternation. Obdiplostemony and other departures from alternation are explained by restrictions of time and space during ontogeny. The "rhythm" is said to be interrupted by a state of "congestion" or "block," which being removed a new rhythm is introduced. Superposition of the parts of successive whorls is due to "condensation" of the vascular "cords," this in turn being effected through stringencies of space. It is hard to understand how the delimitation of their future vascular supply can condition the appearance of floral parts. Indeed, there is a marked tendency of the reasoning at any point to degenerate into teleology.

All recent work on the nature of the hypanthium or floral tube of epigynous flowers is dismissed with the purely dogmatic statement that this structure is composed of the undifferentiated bases of the floral parts.

The end of investigation into carpel morphology is not yet. The interpretation of the Cruciferae currently offered as an alternative to Miss Saunders' solid carpels is not much more satisfactory. It seems a pity that in a field which still demands both careful observation and careful reasoning, scientific investigation should be supplanted by grandiose and somewhat mystical theories of floral structure.

H. W. RICKETT.

Insect Pollination Shown in Glass

GLASS FLOWERS from the Ware Collection in the Botanical Museum at Harvard University. Insect pollination series with 16 color plates by Fritz Kredel. Harcourt, Brace & Co., New York. 1940. $1.50.

A small but important section of the contribution of the Bohemian family of Blaschka in making the famous glass models of flowers now at Harvard and of the American benefactors, Mrs. Elizabeth C. Ware and her daughter, Miss Mary Lee Ware, in making the entire collection a gift to the university, is represented in a slender book which depicts in color 16 models showing insect pollination of flowers.

The story of the Blaschkas is first briefly told. Five pages of the text following the illustrations describe insect pollination in general, and 18 pages more give notes on the individual plates. The plants shown are *Yucca filamentosa, Paphiopedilum insigne, Odontoglossum grande, Aristolochia fimbriata, Delphinium nudicaule, Cytisus scoparius, Phaseolus multiflorus, Oxalis valdiviensis, Impatiens Roylei, Viola odorata, Passiflora caerulea, Lopezia coronata, Primula officinalis, Menyanthes trifoliata, Pinguicula vulgaris,* and *Succisa pratensis.*

CAROL H. WOODWARD.

Introduction for the Experienced

AN INTRODUCTION TO GENETICS. A. H. Sturtevant and G. W. Beadle. 391 pages, illustrations, index. W. B. Saunders Company, Philadelphia. 1939. $3.25.

While this work is aimed to serve as an introduction to genetic studies, it is in no sense a work for amateurs. The authors reverse the usual procedure in handling the subject, placing the historical chapters at the end of the book while the first chapters deal at once with Sex Chromosomes, Sex Linkages and Autosomal Inheritance. The further chapters

on linkage are clearly written and well illustrated. For those who have followed the Blakeslee symbols "+" and "−" to indicate differences in sex in the fungi, the established practice of geneticists of using the sign + to indicate wild type is somewhat confusing, especially as these symbols (+ and —) had long ago been used in checkerboard diagrams by those studying sex reactions in the fungi to indicate whether certain matings in heterothallic species result in the production of fertile fruit bodies or not. Priority in such things, however, should not stand in the way of progress, especially in genetic studies where such great advances have been made in recent years. No doubt mycologists studying inheritance in the fungi will be obliged to fall into line with practices of the geneticists. It would certainly be confusing if Lindegren should continue using +/— symbols to denote sex reaction types and at the same time employ + and — for wild type and x chromosomes.

Considerable space is given to the genetics of plants, including a short discussion of inheritance in certain fungi. For the beginner Chapter 23, "Historical," is especially interesting.

This is one of the most helpful of recent books discussing the principles of genetics.

B. O. Dodge.

Drawings With Text For Beginners

THE GARDEN CLINIC. Laurence Blair. 146 pages, illustrated with drawings by the author; indexed. Macmillan Co., New York. 1940. $2.

The proper appraisal of any work on the art of gardening must be fundamentally concerned with three main features: the correctness of the information it contains, the manner of its presentation, and the practicability of its application at the hands of those who may use it as a guide.

In using this yardstick against The Garden Clinic, it could be said that, in the aggregate the information is good, and as a guide in garden practice, because of its abundant illustrations, it should prove valuable to the beginner. What few errors there are in the cultural instructions given are not serious.

The title, however, is a misnomer. The term *clinic* is associated with diseases and pests and since the book deals with these only superficially, another name would have been more appropriate.

The author too has departed from the style of standard works on gardening by not making a clean division between annuals and perennials. He has taken a number of groups, such as Campanulas, and discussed each as a unit, and there are other instances also where beginners will be confused. As an example: The hardy perennial asters of the genus *Aster* and the annual asters (*Callistephus chinensis*) are mentioned together with but slight reference to their differences botanically.

Another grievous fault is the way he has apparently tried to simplify names by pluralizing. One meets such terms as Digitalises, Dianthuses, Gladioluses, and Salpiglossises. Such liberty is hardly to be commended. But, if one can overlook the faults of the book in favor of the information it contains in the text and illustrations it should be a useful addition to the beginner's garden library.

P. J. McKenna.

Garden Poetry

MY NEIGHBOR'S GARDEN—AND MINE. Nancy Richey Ranson. 47 pages. The Kaleidograph Press, Dallas, Texas. 1939. 50 cents.
THERE WAS A GARDEN. Daisy Lemon Coldiron. 68 pages. The Kaleidograph Press, Dallas, Texas. 1940. $1.50.

Here are two small books of verse, one from Texas, one from Oklahoma. A stanza from each will best depict their style. From My Neighbor's Garden we quote:

BLUE FLAX

Its roots caress the friendly earth;
Its face reflects the sky;
The fabric fashioned from its growth
Snares tempests roaring by . . . . . .

From There Was a Garden we select:

IRIS

If there is one flower more than another
That ought to be sacred to Oklahoma
As the lotus to the Nile,
Surely, that flower is
The iris.
Flags
We called them as we set them there
on the fireguards
Which delimited the yards around our
sod houses.
Dugouts or shacks . . . . . .

Both books reflect the authors' feeling for flowers.

Carol H. Woodward.

Notes, News, and Comment

National Academy. Dr. William J. Robbins gave a paper on "Growth of Excised Roots and Heterosis in Tomato" before the meeting of the National Academy of Sciences in Philadelphia Oct. 28-30. Dr. Sam F. Trelease of Columbia University, a member of the Garden's Board of Managers, addressed the group on "Physiological Differentiation of Astragalus in Response to Selenium." Dr. B. O. Dodge of the Garden also attended.

Among Members. A bronze medal for horticultural achievement was awarded to Mrs. Jerome W. Coombs of Scarsdale, a member of the Advisory Council of the Garden, by the Ninth District of the Federated Garden Clubs of New York State. Until recently Mrs. Coombs was for many years chairman of horticulture for the National Council of Federated Garden Clubs.

Max Schling was honored at the World's Fair by having his name inscribed on the Wall of Fame on the American Common in recognition of his contribution to American horticulture. The names selected for the panels which surround the Common are all of foreign-born citizens or of American Negroes or Indians who have made outstanding contributions to American culture.

Two brief courses in landscape architecture have just been concluded by Mrs. Annette Hoyt Flanders at the Waldorf-Astoria Hotel. The first was on The Designing and Building of Gardens and the second on Plant Material and How to Use It.

Radio. Speaking in the General Electric Science Forum, Dr. A. B. Stout gave an address Sept. 26 on "Autumn Coloration" from Schenectady over stations WGEA and WGEO, and later the same day over WGY. Mrs. Jerome W. Coombs spoke on the program of the Radio Garden Club of the Agricultural Extension Service of Rutgers University Oct. 11 over WOR and the affiliated stations of the Mutual Broadcasting System. Her subject was "Gardening Indoors: Bulbs."

Grapes and Poplars. Dr. A. B. Stout returned in early October from a trip during which he spent 10 days at the State Agricultural Experiment Station at Geneva, N. Y., in connection with his research on hardy seedless grapes. He reports 17 new seedless seedlings obtained in breeding, making the total of such seedlings now 225. After a visit to the Montreal Botanical Garden he spent several days along the Winooski River in Vermont with Dr. E. J. Schreiner, inspecting the plantings of hybrid poplars for river-bank erosion control. Dr. Stout is co-operating with the U. S. Forest Service in the breeding of poplars for such work. He also spent a day at the Hopkins Memorial Experimental Forest near Williamstown, Mass.

Student Gardeners. John Moss, who went to Yale University last year as Propagator in the Bureau of Planting, has been transferred to the School of Botany as Horticulturist. Working under Dr. Edmund W. Sinnott, he will have charge of the new modern greenhouse which is to be constructed this year.

Albert E. McKay, a former apprentice gardener, is now at Hoodacres, the delphinium breeding establishment of Charles F. Barber at Troutdale, Ore. He is to assume the responsibility of the enterprise and continue the breeding work initiated by Mr. Barber, who is retiring because of his age and health.

J. J. Elliott, whose term of service as an exchange student gardener from Edinburgh was cut short by the European war, has recently been taken into the R.A.F. as a radio operator. He writes from his father's rock gardening establishment, The Plash, at Stevenage, England:

> "Gardening as a whole is almost at a standstill over here now except for the vast food production campaign, for which allotments have been cropping up like mad all over the country. A great many of the public parks have turned large areas over to vegetables though they keep up as much in flowers as their depleted staff and funds allow. The nurserymen's plight is pretty bad and many of the smaller firms have gone under. At my father's place the business in alpines is practically at a standstill but we are managing to just tick over by growing medicinal herbs. Our staff is reduced to about a fifth of the normal."

Harold Davidson, a student gardener since last March, left last month to join the signal corps of the United States air force.

Cacti. A sturdy six-foot specimen of *Carnegiea gigantea,* the suhuaro of the southwestern desert, is among 46 cacti and other succulent plants presented last month to the Garden by Mrs. Isaac Gimbel of Portchester, N. Y. Mrs. Gimbel has had the specimen under cultivation in her greenhouse for eight years, an exceptionally long time for a suhuaro to thrive outside of its native habitat. Another noteworthy plant in the collection is a specimen of *Opuntia brasiliensis,* one of the South American prickly-pears, standing more than eight feet high and having a trunk 3 inches or more in diameter.

Groups. A horticultural field trip was made on Oct. 4 by 15 students in the Department of Landscape Architecture at Columbia University under the direction of their instructor, Howard R. Sebold. During the morning the plant materials class observed some of the Garden's choice shrubs and the Advisory Council's perennial border. In the afternoon the group studied perennials, annuals, and aquatics in the vicinity of the Main Conservatories.

At the second autumn gathering of the School Art League at the Botanical Garden, Saturday morning, Oct. 19, William C. Palmer, mural painter, addressed the 425 students present before they adjourned to the grounds for sketching.

A biology class of 19 students with their teacher from Manasquan High School in New Jersey visited the Main Conservatories and the outdoor displays Oct. 11. On Oct. 10 and 11 visits to the Garden were made by the Smithtown (Long Island) Garden Club and the Green Acres Garden Club of Armonk, N. Y.

From China. Dr. Roberta Ma, who is on leave from Sun Yatsen University in Canton, where she has been professor of mycology, bacteriology, and plant physiology, will spend a year doing research in Dr. Robbins' laboratory at the New York Botanical Garden. Dr. Ma is a graduate of the University of Texas, and was also awarded her doctorate there.

Visitors. Among October visitors who registered in the library and the mycological herbarium at the Garden were Wanda K. Farr of Greenwich, Conn.; M. A. Chrysler of New Brunswick, N. J.; David R. Sumstine of the Carnegie Museum at Pittsburgh; R. R. Fenska of the Bartlett Tree Research Institute; Ira J. Condit of the University of California, and A. J. Grout of Manatee, Fla. A. J. Bisaillon, former student gardener, now with the Montreal Botanical Garden, visited here Oct. 4.

Flower Show. Stone and windowed plants of the South African desert were exhibited by the New York Botanical Garden at the Fall Flower Show at Glen Cove, Long Island, Oct. 30 to Nov. 5. They were displayed in a specially built terrarium 30 feet long and 3 feet wide.

Lectures. Dr. H. N. Moldenke spoke on "Treasures of the Watchung Hills" Oct. 7 before the South Orange Garden Club and on Oct. 23 before the Short Hills Garden Club. On Oct. 15 he spoke on "A Naturalist in Florida" before the Natural History Department of the Brooklyn Institute of Arts and Sciences. Dr. Fred J. Seaver addressed the Matinecock Garden Club of Glen Cove Sept. 13 on "Scenes and Gardens in Bermuda." Dr. W. H. Camp spoke in Salem, Mass., the evening of Oct. 5 on "Winter in Oaxaca" before the Salem Garden Club and neighboring organizations.

Carnation Tour. Thomas Laskaris was among those who attended the annual Carnation Tour on Long Island Sept. 11. Dr. Jack Bickerton of Cornell University, who had been doing some work at the New York Botanical Garden just previously, explained his special research on carnation diseases and gave cultural directions, especially with reference to the control of the numerous diseases to which carnations are subject.

THE NEW YORK BOTANICAL GARDEN

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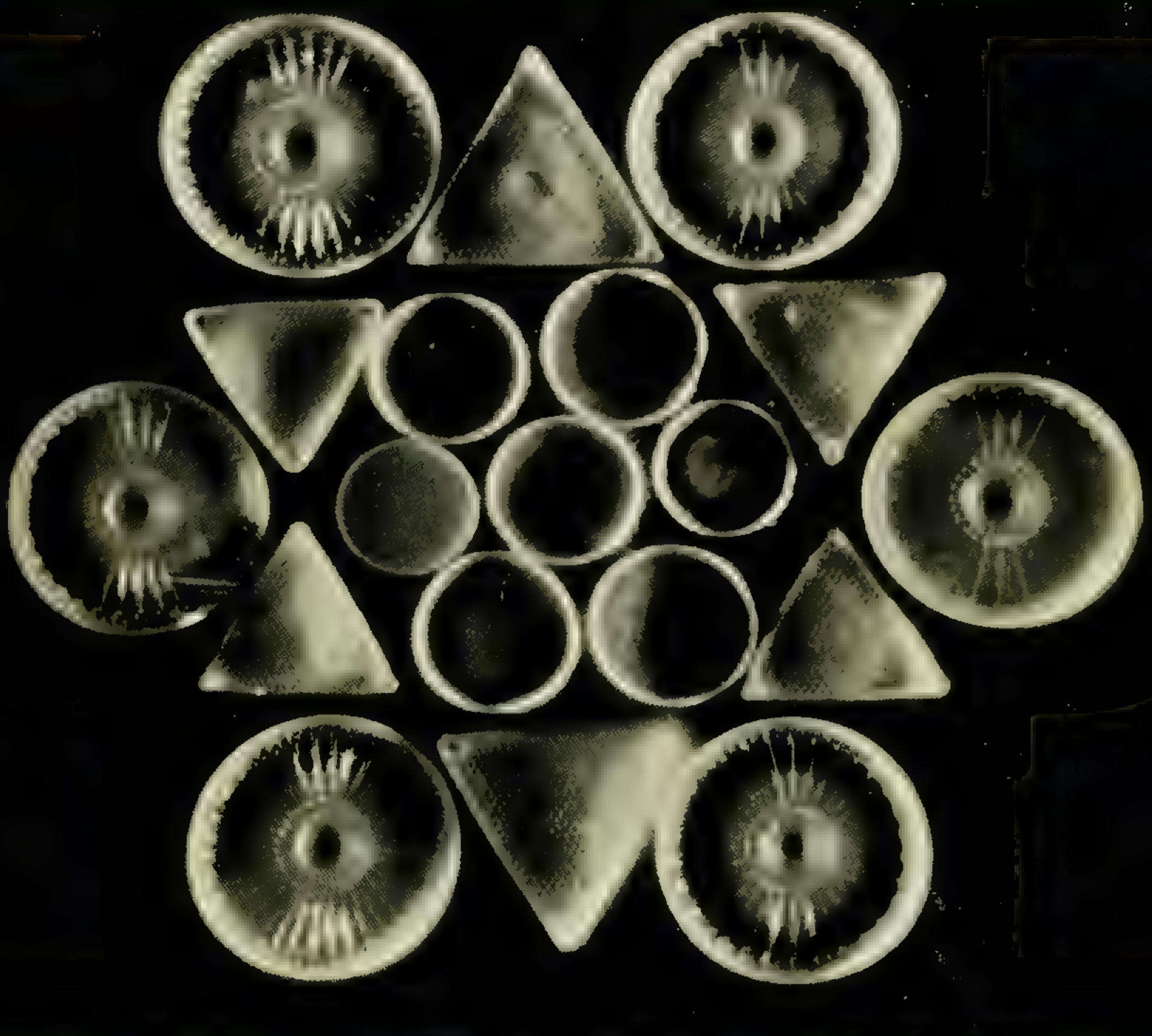

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor
December, 1940

ARRANGED DIATOMS (ARACHNOIDISCUS AND TRICERATIUM)
Cover Photograph by Philip O. Gravelle
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WHY A BOTANICAL GARDEN?

Plants are as fundamental to life as the air we breathe. They preceded man on the earth, they nourished him when he came, and they provided food for the animals which were also a part of his diet. Then gradually they assumed a place of significance in his consciousness.

Some of the earliest scientific observations made were directed at plants, probably in recognition of their vital importance, but also because of their appeal to the senses. Some of the earliest forms of art depicted plants: the gourd, the fig, the vine, and the ear of maize representing utensils and food; papyrus and others for symbolism; the lotus, acanthus, and lily for their beauty.

Names of famous gardens and gardeners have been handed down from the classical period. Later, when plantings extended beyond the walls of the monasteries, where during the dark ages tradition and technique had been preserved, gardening became an accepted household occupation. From a collection of herbs grown outside the kitchen door for food and medicine, the garden again became a thing of beauty, and what began as a chore became a profession and an art.

Man early learned to distinguish the harmful plants that he saw, but it was many centuries before he discovered that there are other kinds, microscopic ones, which cause our common diseases and also prey upon vegetation. These can be conquered only with a thorough knowledge of them, to acquire which means many years of study and special scientific equipment.

The need for botanical gardens has been realized and met for 2,300 years—possibly longer. Their functions are plant discovery, classification, culture, breeding, exhibition, and research, incidentally giving the public a chance for study and esthetic pleasure As centuries ensue they will continue to serve in many ways, not the least of which lies in providing the sort of beauty, the feeling of comfort and pleasure that only plants can give.

For these reasons private fortunes and public funds, as well as the combined donations of many individuals, have been advantageously used for maintaining botanical gardens.

A worried world needs beauty and knowledge far more than a world enjoying peace of mind. In times of upheaval, society can least afford to sacrifice sources of permanent human satisfaction.

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VOL. 41 DECEMBER 1940 NO. 492

IT is with a sense of great loss that the New York Botanical Garden records the death of Henry Hurd Rusby, Honorary Curator of the Economic Collections. Among Dr. Rusby's many activities was the creation and development of the Garden's collection of more than 7,000 specimens of economic plants in the Museum Building. He was especially active during the early years of the Garden and held the post of honorary curator from 1898. A biography of Dr. Rusby will appear in a forthcoming number of the Journal. He was 85 years old at the time of his death on Nov. 18.

Study Room For Diatoms and Myxomycetes To Be Formally Opened Jan. 11, 1941

THE SPECIAL ROOM for the study of diatoms and myxomycetes, which has been set aside on the third floor of the Museum Building, will be formally opened with a program to take place the afternoon of Saturday, Jan. 11.

The occasion will coincide with a field trip of the Torrey Botanical Club, scheduled on that day for the inspection of the new room and its facilities. The club, with members of the Garden, of the New York Microscopical Society, and others interested in these two forms of plant life, will meet at 1:30 p.m. in the Members' Room for a program in which Dr. William J. Robbins, Dr. Fred J. Seaver, and the honorary curators of myxomycetes and of diatoms, Robert Hagelstein and Joseph F. Burke, will take part. At 3 p.m., after having been shown some of the outstanding specimens in the collections, those present will have the opportunity of hearing Mr. Burke speak on diatoms at the regular Saturday afternoon lecture.

The new room, which is in the Cryptogamic Herbarium, houses the Garden's large collections of myxomycetes and diatoms, and the literature pertaining to them, and is furnished with tables and a microscope for the use of research students of these groups.

The Diatom Collections At The New York Botanical Garden

By Joseph F. Burke

WITH the addition to the Diatom Collections of the loan-deposit by Robert Hagelstein[1], announced in this Journal for last June, the New York Botanical Garden is able to offer for the use of research students an assembly of diatom material unusual in its size and comprehensiveness. The collections have been placed in a special room which is to be formally opened on the afternoon of January 11, 1941. In this room have been placed also the Myxomycete Collections, the size and importance of which are also due in large part to the efforts of Mr. Hagelstein. The room, on the third floor of the Museum Building, in the Cryptogamic Herbarium, is a monument to Mr. Hagelstein's activities in a field in which he is not professionally engaged, but to which he has devoted a considerable part of his time. The deposit represents not only his own efforts, but also the concentration of the work of a large number of scientific workers, both professional and non-professional, over a long period of years.

Throughout his business career in New York City, where he was born in 1870, Mr. Hagelstein always found time to pursue his scientific interests. While a resident of Brooklyn, he became an active member of the Department of Microscopy of the Brooklyn Institute of Arts and Sciences. An early interest in minerals turned to diatoms when he met Henry S. Woodman and this interest developed and increased throughout the years. While still a business executive, he met many eminent diatomists and established close relationships especially with Dr. Albert Mann of Washington and Charles S. Boyer of Philadelphia. Through the latter he became acquainted with others of the noted Philadelphia group of diatomists, including Frank J. Keeley, T. Chalkley Palmer and Dr. Thomas S. Stewart. He corresponded with Prof. C. J. Elmore, authority on Nebraska diatoms, and with Dr. G. Dallas Hanna of California, specialist in the fossil forms. In Washington he met Alvey A. Adee, former Second Assistant Secretary of State, who was noted for his beautiful diatom photomicrographs, of which Mr. Hagelstein has a large collection.

A change of residence from Brooklyn to Mineola facilitated his study

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[1] This collection represents Mr. Hagelstein's lifetime accumulation, including 1,000 slides of "Les Diatomées du Monde Entier," 2nd edition, by Tempère and Peragallo. From his entire collection, Mr. Hagelstein has retained for his own use only the set of *Diatomaceæum Species Typicae* by H. L. Smith, which was already in the Garden collections; J. D. Möller, 400-type slides, numbered 26 and 32, of 1868 together with other type slides by the same mounter; the type slides from the Dr. D. B. Ward collection, and other slides of a similar nature.

of the diatoms of Long Island, and an extensive series of slides and unmounted material represents this period in his collection. Many of the important records established are recorded in the "Synopsis of North American Diatomaceae" by Boyer.

After the decline of the Department of Microscopy in Brooklyn, Mr. Hagelstein, with many of his associates, became active in the New York Microscopical Society, which from 1916 onward reassumed the position it had held in the eighties and nineties. Needless to say his active interest in diatoms communicated itself to others, and Philip O. Gravelle, Charles P. Titus, Joseph W. Grant, Dwight L. Elmendorf, and Ganson Depew were among his fellow workers. Contacts were also made with diatomists of an earlier generation including Charles F. Cox, Romyn Hitchcock and Mary A. Booth. His increasing list of correspondents included Oliver Kendall, Jr., of Providence, R. I., and Dr. Vida A. Latham of Chicago.

When the extensive collection of Dr. David B. Ward of Poughkeepsie was placed on the market, Mr. Hagelstein acquired the specialized library and the entire lot of slides. Part were mounted from the cleaned diatom material used by H. L. Smith in his *Diatomaccarum Species Typicae*. In 1893 this material had been sold to Dr. Edward F. Hodges of Indianapolis, and two years later it had been acquired by Dr. Ward. The series of slides issued by Prof. Smith had included both balsam and dry mounts. While the former, as would be expected, are still well preserved, the latter have deteriorated so as to be of little use; but fortunately Dr. Ward mounted slides from practically all of the original collections in a permanent medium of an even higher refractive index than balsam. The value of this can be appreciated by all diatom taxonomists, for the Smith collections included much type material. Though Mr. Hagelstein did not acquire Smith's material from the Ward estate, the original handwritten catalogue thereof, by H. L. Smith, with notes of acquisition by subsequent owners, was included in the library.

The Ward purchase comprises the largest unit in the deposit and next in importance is the series of excellently mounted slides of the W. A. Poyser collection. The association of the latter with Charles S. Boyer in Philadelphia was of the utmost importance in the naming of the mounted species. It led to the mounting of a number of new species which Boyer named. When the slides were acquired, the types were included. These were turned over to Mr. Boyer by Mr. Hagelstein and are now at the Academy of Natural Sciences of Philadelphia in the Boyer Collection.

In 1923 Mr. Hagelstein became President of the New York Microscopical Society and served two terms. During this period there was much experimenting with mounting media that would enhance the diatom image. George H. Needham and W. Faitoute Munn, both interested in

diatoms, produced such media—Mr. Munn turning out an American styrax specially refined.

Dr. Nathaniel Lord Britton, a member of the Society since 1882, invited Mr. Hagelstein to prepare a report on the Diatomaceae of Puerto Rico and the Virgin Islands, to be included in the Scientific Survey that the New York Academy of Sciences had undertaken to publish. This gave fresh incentive to Mr. Hagelstein's diatom studies, though by now he had branched out to include the myxomycetes. His retirement from business permitted this undertaking, for only thus could his time be devoted fully to scientific pursuits. An initial trip to Puerto Rico in 1926 was followed by other trips in 1928 and 1929. The report was published in 1939.

The completion of this task has enabled Mr. Hagelstein to concentrate on the investigations he had conducted simultaneously for a number of years in the myxomycetes, though he has continued to correspond with other diatomists, including Paul S. Conger of Washington; James R. Bartholomew of the Farlow Herbarium in Cambridge, and J. H. Robinson in Barbados. His ever-willing readiness to teach others has served to interest many in this study, especially his associates in the New York Microscopical Society—Joseph F. Burke, Dr. William H. Wiegmann, Richard F. Lawrence, and J. L. Cloud.

The original slides, with complete records, and the original material of the Puerto Rico undertaking comprise the last important unit of the Robert Hagelstein Collection.

Some 2,000 slides acquired from the family of the late Cornelius Van Brunt formed the basis for the Garden's diatom collection. In 1939 these were gone over and arranged by Rosalie Weikert, Technical Assistant at the Garden. There have been added to this basic collection during 1940 nearly 1,000 slides, including the Clarence Jerome Elmore Collection through the generous gift of his daughter, Mary Elmore Sauer. Miss Weikert is now arranging this collection, which, as it formed the basis of Prof. Elmore's work on the Nebraska diatoms, will be of special value to students working on the diatoms of that region. Important additions to the collections include the Gravelle Photomicrographs described in this issue and a complete series of the numbered samples of material used by Dr. G. Dallas Hanna in his study of the Florida Peat Diatoms, mentioned in the October Journal. Since then the gift has been augmented by portions of the two original samples which served as a basis for most of the illustrations used by Dr. Hanna. These gifts come from Herman Gunter, Florida State Geologist, and Dr. Hanna.

Another valuable accession is the series of slides prepared by Dr. Ruth Patrick of the Academy of Natural Sciences of Philadelphia from the Rabenhorst collections of European algae, and from other specimens in the Garden herbarium.

Gravelle Photomicrographs A Gift To the Garden

By Carol H. Woodward

FOR a week before and after the formal opening of the special room for diatoms and myxomycetes—Jan. 4—18—there will be on the main floor an exhibit of photomicrographs of diatoms, made by Philip O. Gravelle. These photographs, which represent the work of one of the outstanding photomicrographers of the present day, have been presented to the Garden by Mr. Gravelle and will be permanently hung in the diatom room. A number of them appear as illustrations in this number

A diatom which Mr. Gravelle has photographed in two planes, magnified 720 diameters. It is a specimen of Auliscus speciosus from Temescal Canyon, Calif.

of the Journal, and more will appear in a forthcoming number, for which Dr. Lois Lillick has prepared a comprehensive article on the life story of the diatom. Others in the collection show single specimens, living and fossil groups, and arrangements of diatoms, all photographed by Mr. Gravelle in his studio-laboratory at South Orange, N. J.

Mr. Gravelle is one of that small group of amateurs who, through what was originally a hobby, have made contributions to science. Though not concerned himself with the scientific study of diatoms, he has, through his desire to make perfect reproductions of what the camera can record

through the microscope, aided botanists in their research. For example, his photographs of a diatom valve in cross-section under extremely high magnification reveal seldom-seen details in structure that enter into the functioning of the cell. It was through such painstaking work as this that he was awarded in 1926 the Barnard medal of the London Photomicrographic Society—the first time that the medal had ever been presented outside of the British Isles. He has also been elected a Fellow of the Royal Microscopical Society on the basis of work which he submitted.

At this time, Mr. Gravelle was still in the amateur ranks, a textile designer on week-days and a photomicrographer for amusement on Saturdays, Sundays, and a good many evenings. Then about six years ago, after 42 years with the same company, he resigned in order to devote himself to photomicrography. The hobby which eventually became his profession began many years ago when, feeling surfeited with the snapshot type of photography which had engaged him for years, he experimented with making photographs through a microscope that a friend had temporarily left in his care. From that day to this he has not been without a battery of microscopes and special cameras.

Diatoms, largely because of their availability, seemed the logical material to use in perfecting his microscopical technique; and to a man who had been a designer all his life, their beauty and symmetry gave them a special appeal. (Yet, he says, he has never found one that could be used for a pattern other than a polka-dot.) So he began focussing lenses on these minute one-celled plants, with the result that he has made some of the finest diatom photographs ever seen. Recently, through a multiple focus, coupled with two or more exposures, he has been able to show in one picture details of diatom structure that usually require several separate photographs.

As his skill developed, Mr. Gravelle was given the opportunity to do commercial photography with many subjects, but his interest in the scientific side of his work has never flagged; that is really his hobby today. It is his desire to promote a greater understanding of plants through microscopic study of their structure as recorded through photography.

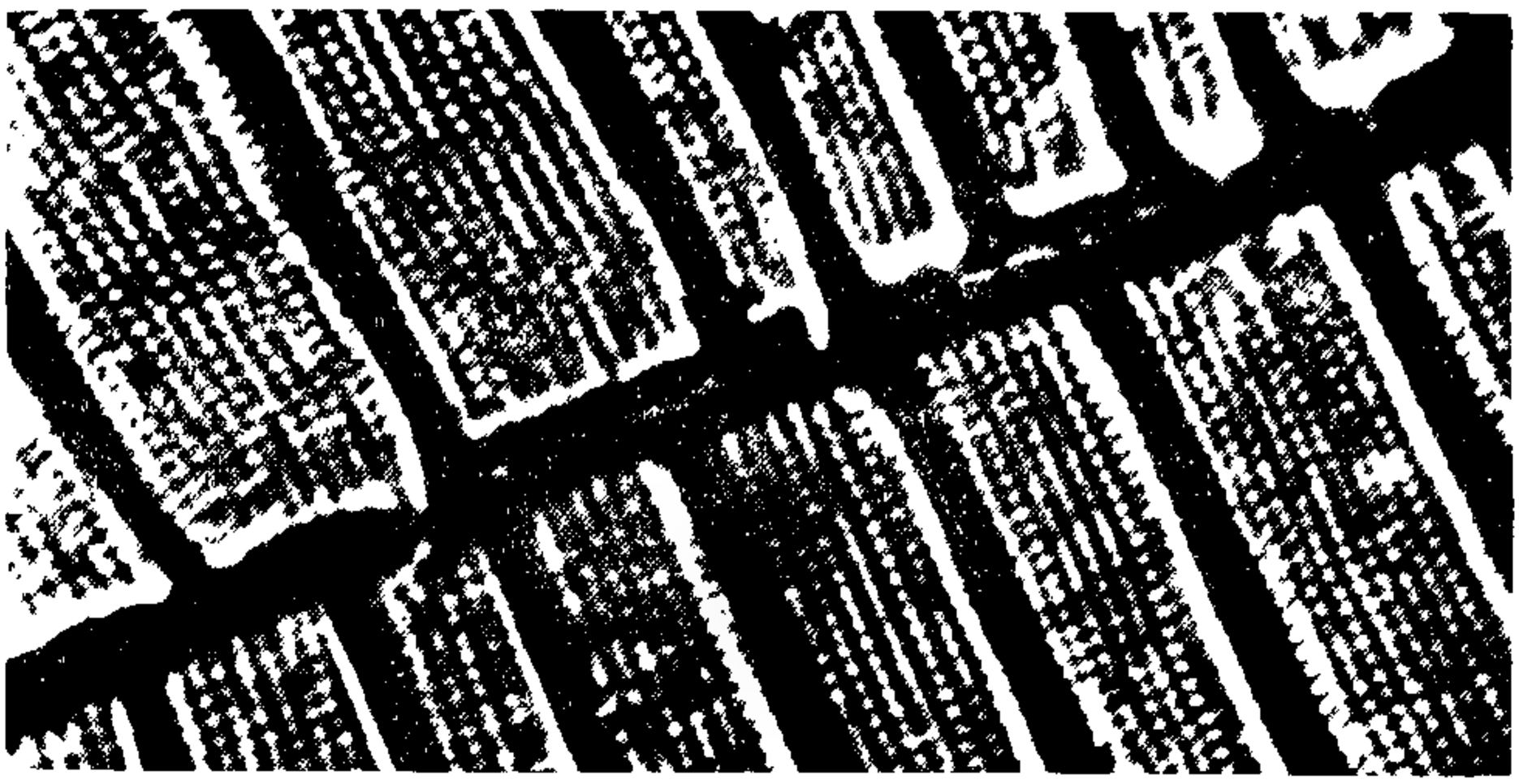
Diatoms And The Microscope

By Joseph F. Burke

WITHOUT the optical assistance of the microscope we can not know the diatoms. It is possible to see the largest of them with the unaided eye, even to the point of discerning their external shape, but beyond this we can not go.

Though some diatoms undoubtedly came under observation with the introduction of the compound microscope in the seventeenth century, it was only toward the end of the eighteenth that they entered into scientific literature.

In the second quarter of the nineteenth century, the achromatic microscope was developed. Until then few diatoms had been described. Previous efforts in microscope design had been devoted to improving the magnifying power of the instrument, and magnification alone would not permit any great knowledge of the diatoms. With the introduction of the achromatic instrument, the principle of increasing the ability of the microscope to render detail was recognized and there followed a period of intense diatom research, commencing about 1830, in which the names of Ehrenberg, Kützing, and de Brébisson played a conspicuous part.



An example of resolution through the microscope in the minute markings of Surirella gemma, magnified 3,600 diameters, and photographed by Herman Adler.

It is unfortunate for the diatom systematist that so much work was accomplished by these workers with the yet imperfect microscopes of their time. The instrument at their disposal functioned about as well as the lowest-power of the standard medical microscope of today. The insufficient illustrating and describing of the early species is one of the greatest obstacles the systematist encounters. However, the great activity of the period had its compensation in the increased interest in diatoms, which created a demand for better instruments. An active demand brings progress, and so it did with the microscope. The early diatomists, and through them the instrument-makers, found in the diatoms an excellent test of the performance of the instrument. Here was a demand upon the ability of the microscope to render detail that caused the purchasers of instruments to become more and more critical. This active collaboration of diatomist and instrument-maker is well illustrated in the relationship between Charles A. Spencer, the first maker of microscopes in this coun-

try, and Jacob Whitman Bailey, professor at West Point, the first American diatomist. When Spencer turned out a lens that would resolve a diatom that Bailey had considered a test, Bailey would find another diatom that the lens would not resolve. Spencer would then set to work to produce a better lens.

The middle of the nineteenth century was a period of constant improvement of the microscope and of considerable progress in the study of the diatoms. The basis was laid for our present conception of them and the improvement in the instruments is reflected in the illustrations of the diatom publications during this period. Still greater progress lay ahead, the period in which the great microscopical societies were being founded. This period of social microscopy formed the background for the "battle of the lenses." The members of the societies formed a ready market for the latest product of the instrument-maker. An objective that could outrival any belonging to members of the same or other societies was a desirable purchase regardless of expense. Many were the orders given to the lens-makers for fine-performing objectives. Not only were objectives improved, but every conceivable method of enhancing their performance by building up the instrument was resorted to. The "battle of the lenses" was not always harmonious, and strained relations were common; but the chagrin of defeat was always to be tempered by the acquisition of the latest improved product of the lens maker.

With all this activity, science was eventually applied to lens manufacture and about the end of the third quarter of the nineteenth century lenses were being made according to optical formulae. Through the efforts of Abbe new glasses were produced and in 1886 he introduced his new and improved objectives of the apochromatic type. These with minor improvements are the best lenses in use today, along with the improved achromatic lenses made possible by the new glasses.

Diatom species by now had become so numerous that many had been named over and over again. During the last quarter of the century greatly improved illustrated works were published and important monographs of genera and larger groups appeared. Sets of mounted slides of named species were issued by authorities. Diatom study reached its greatest popularity.

By now the microscope had been taken over for medical research and had become also an educational instrument in the schools and colleges. Today microscopes are generally distinguished as medical or research stands. But the microscope is passing to the industrial laboratory and becomes the metallurgical stand, the polarizing stand, or even the ballistic stand. Constant mechanical changes adapt it to diverse uses. The optical quality of the instrument remains at the high standard inspired by the desire of the enthusiast to resolve the structure of diatoms. And still more difficult diatoms are awaiting improved optical instruments.

Fruiting Forms And Variegations In The Wintercreeper

By George Graves
Massachusetts Horticultural Society

THE WINTERCREEPER—a general name for the numerous variants of *Euonymus Fortunei*—is a No. 1 guinea-pig for those growers who like to experiment with forms, variations, mutations and variegations. Because of the variation which exists in this group of plants it is sometimes possible, by selective propagation, to derive from a single specimen three or four plants of totally different aspect. It is true that the variation in wintercreepers appears to be somewhat on the basis of "now you see it and now you don't," but it all becomes clear to anyone who lives with the plants long enough. The differing characters are bold; no microscope is needed to distinguish them. And when one realizes what a diversity of useful, hardy, and decorative plants these variations afford, one understands why several varieties of wintercreeper have become as well known nursery products as Japanese barberry, Bowles' periwinkle, and Japanese spurge.

Some of the variants are of the sort known to botanists as "varieties." That is, they represent particular phases of the plant as it is found growing wild in well defined geographic districts. Others are what are known technically as "forms," the epithet "form" being applied to differences which appear in individuals growing in the same areas as typical plants. Some such forms may represent genetic segregations or recombinations, usually referred to as "breaking up," or they may also arise from sudden cell changes called mutations or sports.

In the wintercreeper, mutations appear usually as stems which bear variegated leaves, and such variegated plants may grow up to be green or, at least, to display green shoots. The explanation of such reverting would be the occurrence of a second mutation, back again to green. There is another less subtle sort of variation in the wintercreeper. Like the English ivy, it bears its flowers and seeds on specialized branches and its fruiting wood differs from the sterile vegetative growth in having noticeably larger leaves and a more shrubby aspect. The formation of these fruiting branches seems, as in the ivy, to take place only after the climbing growth has reached the limits of the support on which it finds itself. Also, as with the ivy, cuttings may be rooted from the fruiting branches and established as independent specimens, though they are not complete plants; when set in the open, they usually remain shrubby.

If suitable support is available, these fruiting plants do, at times, give rise to climbing shoots, and this second climbing growth (like that of

ivy) is sometimes distinct from the first in appearance. Thus, by selective propagation, a single seedling may be made into three plants of differing aspect, and if variegated shoots are present, it is possible to make more than three.

Some of these variants are found in nature, others are known only in gardens; most of them have been recorded in the manuals of cultivated plants. But, while gardeners have been enjoying the wintercreeper, the botanists have also been giving it attention. It was only two years ago that Prof. Alfred Rehder published the accumulated results of a series of studies of the species, and in the light of the new information which he gives we must now revise our ideas of the relationships of the winter-creepers. Along with changes in classification have also come name changes. Here is the story of what has happened.

It all goes back to a specimen which Robert Fortune collected in China in 1845. Turczaninow, a Russian botanist, named this plant of Fortune's *Eleodendron Fortunei.* Later, another European, Handel-Mazzetti, determined rightly that it belonged in the genus *Euonymus.* However, he referred it mistakenly to *E. kiautschovica.* It remained for E. D. Merrill to recognize that Fortune's *Euonymus* was identical with what we have known as *E. radicans acuta.* This last was collected in China by E. H. Wilson in 1907 and named by Rehder. Therefore, *E. radicans acuta* becomes *E. Fortunei* by reason of priority. The rules demand the change.

This process of untangling has resulted in the sharp-leaf wintercreeper —the type which is wild over much of China—becoming the subject head under which are now indexed the other expressions of the species. This Chinese type is a somewhat thin-stemmed ground-cover having relatively long, narrow, pointed leaves. In the open, it is a free-spreading, mat-forming plant which roots down as it reaches out for more soil to blanket, and under such culture, it is less apt than the smaller-leaved variants to display the humps marking the original plant centers. When tree trunks or other supports are encountered it can become a root-climber. In gardens, however, it does not show the same easy disposition to climb as does the Japanese type, *E. Fortunei radicans.*

Differing little from the type is *E.F. colorata,* which is becoming the more popular of the two in gardens. This form, which is distinguished by its reddish-purple winter color, is not known in the wild. All plants have come from a seedling which appeared among the progeny of a seed collection made in Shensi, China, by F. N. Meyer in 1914. Like the type, it is shade-tolerant but under darkened conditions it cannot be expected to color up as well as when fully exposed.

The smaller-leaved Japanese variety, *E.F. radicans,* was introduced to cultivation about 1865 -twenty years after Fortune's collection—and

until now, it has been looked upon as being the type of the species. Although its name is familiar, it has lost popularity to other more "gardenesque" varieties and forms. Among these last is the fruiting variety *E.F. vegeta,* known as the bigleaf wintercreeper, introduced in 1876. Although it can become a root-climber, it is usually seen as a shrubby ground-cover, as the foundation of low-clipped hedges, or as independent plants facing off groupings of larger shrubs. Its bittersweet-like fruits give it much decorative interest. Its relatively large, round leaves make it an effective broad-leaved evergreen.

Another fruiting form, also of evident derivation from the Japanese type, is *E.F. Carrierei,* the glossy wintercreeper, introduced to gardens in 1881. Of the two, this is the more permanently shrubby. It has equally large leaves which are longer, narrower, and more shining than those of *E.F. vegeta.* In gardens, it fruits much less profusely than does the bigleaf wintercreeper. But for a low wall or as an independent shrub in light shade it is hard to beat. One of its common habits is the production of variegated-leaved shoots, which have often been propagated as independent plants. The clone ***Silver Queen*** is doubtless of such origin. Other variegated forms of the Japanese type are lumped together under two headings. *E.F. reticulata* takes care of those with white variegation along the veins of the leaves. Those with white, yellow or pink leaf margins are tumbled into *E.F. gracilis.* Thus are two groups of inconstant and ill-defined forms classified.

A still finer-branched, smaller-leaved, less vigorous seedling form is *E.F. minima,* the baby wintercreeper, introduced, apparently, by a French nurseryman in 1912. Very much like it is the yet tinier-leaved *E.F. kewensis* which is reputed to have reached Kew from Japan through Professor C. S. Sargent in 1893. Neither of these little plants shows much inclination to climb, and as a result they are restricted in use to covering ground in small areas, or as rock garden plants. They are listed as being sterile, but the larger of them has fruited in this country. However, like its type, it changed its appearance in fruiting and the flowers came on gross shoots totally unlike the non-flowering phase of the plant.

It is on the heavy-stemmed bigleaf wintercreeper that the euonymus scale insect is most troublesome. In most cases the infestations are not noticed until the branches of the plants are white with scales. Such advanced attacks are difficult to control. Theoretically, these insects should succumb to repeated applications of contact insecticides during the early and late summer. In practice, their elimination is not accomplished so simply.* Cutting back and complete renewal of infested growth has

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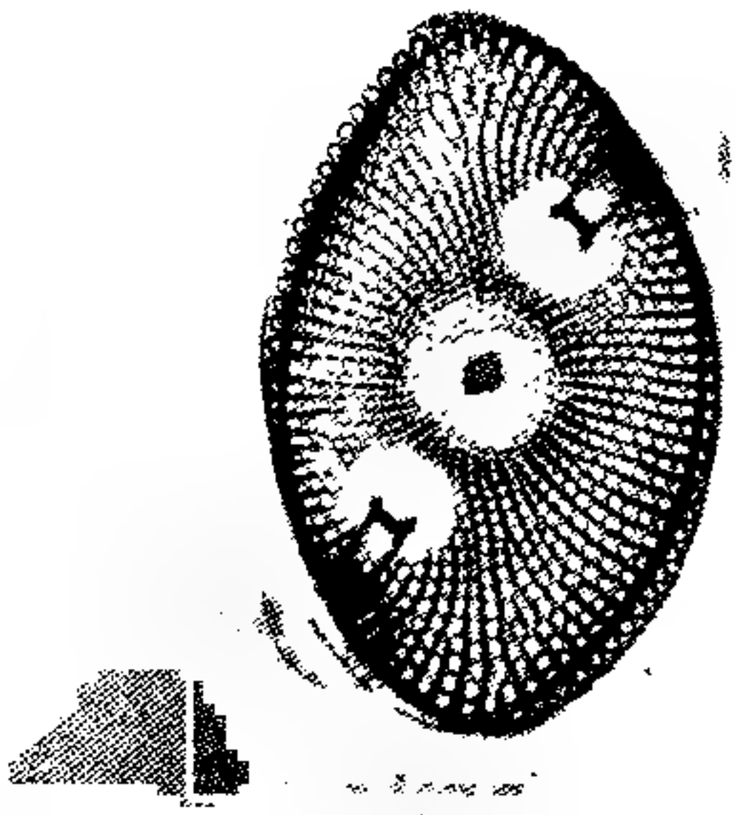
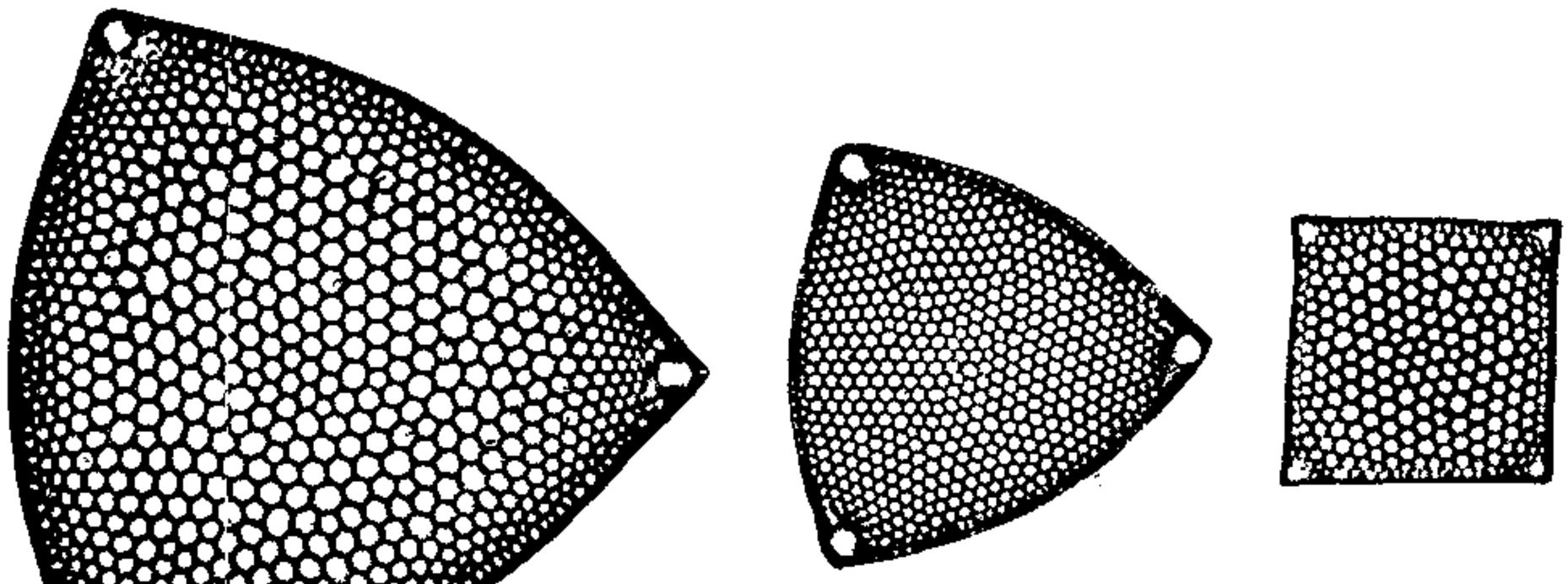
* Professor W.D. Whitcomb has recently suggested an early spring spray of dormant oil 3% strength. This may be followed up, he says, by two sprays at ten-day intervals during the hatching period in June. For these June sprays, the recommendation is 1% summer oil combined with 40% nicotine sulphate, 1 to 800. In

Licmophora flabellata (x 70), a marine diatom which grows attached to a long gelatinous stalk.

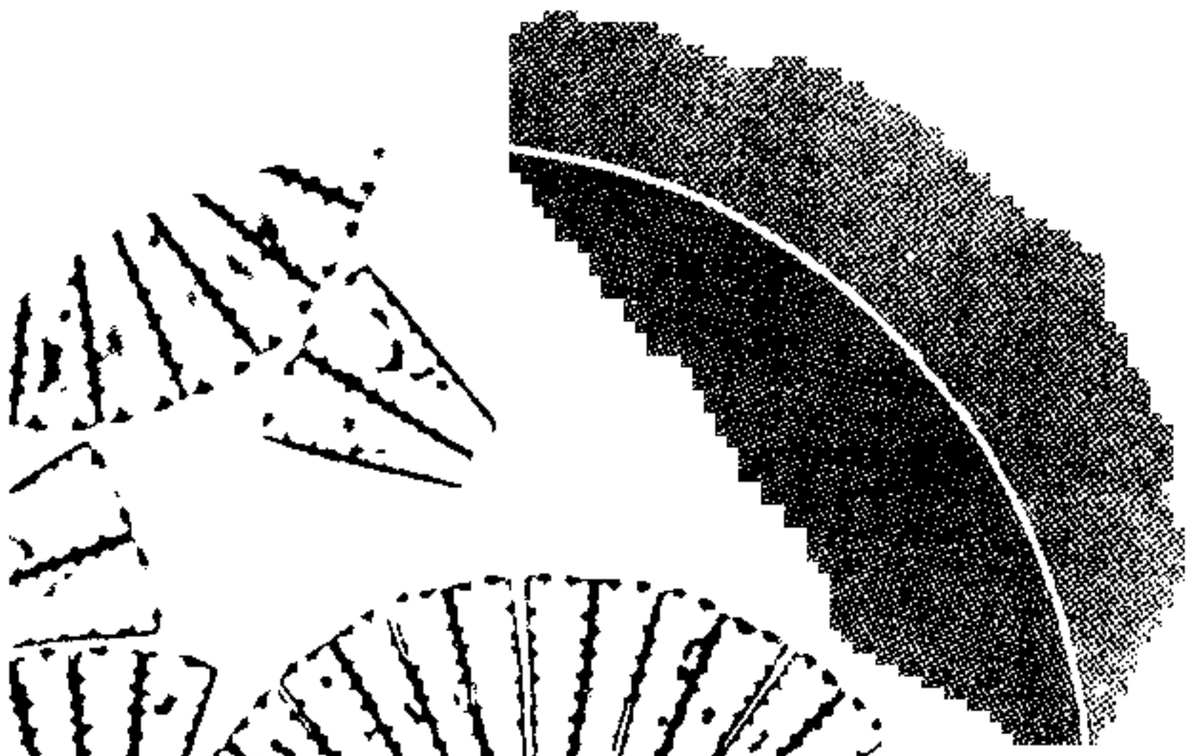


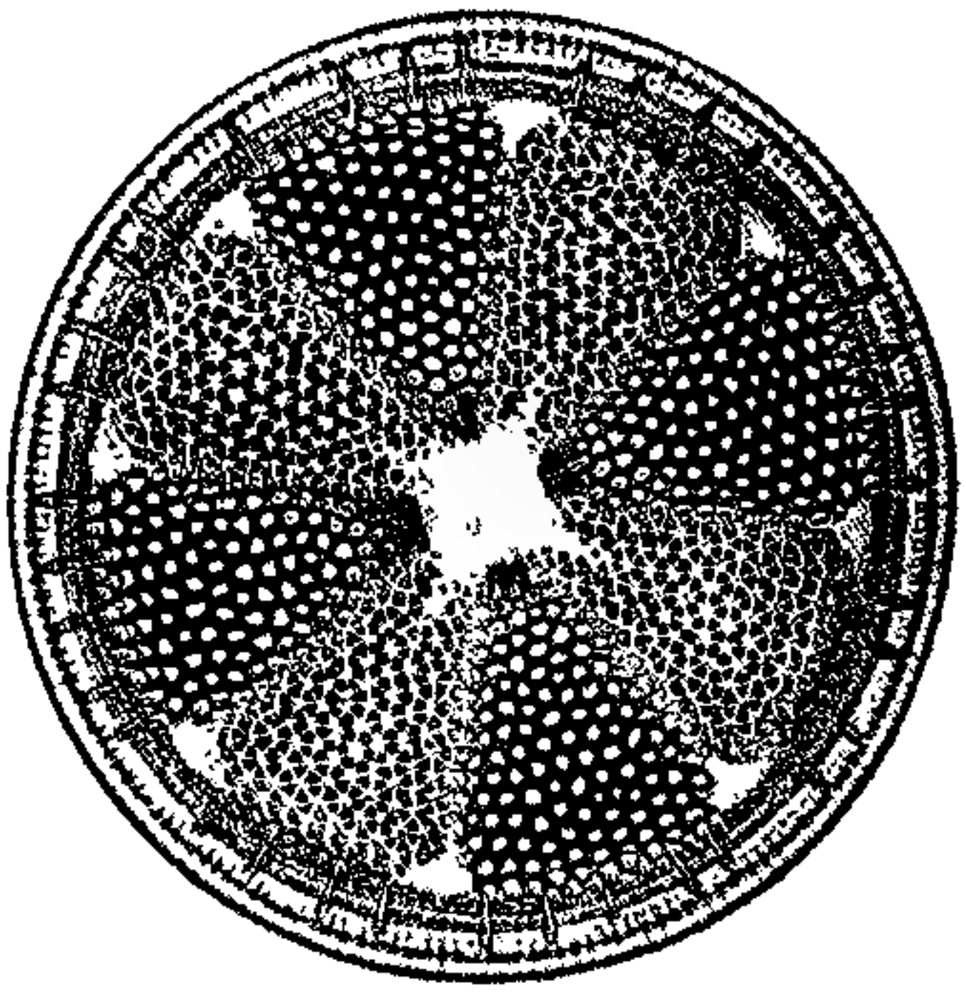
Kittonia elaborata (x 200), a fossil diatom from Oamaru, New Zealand.



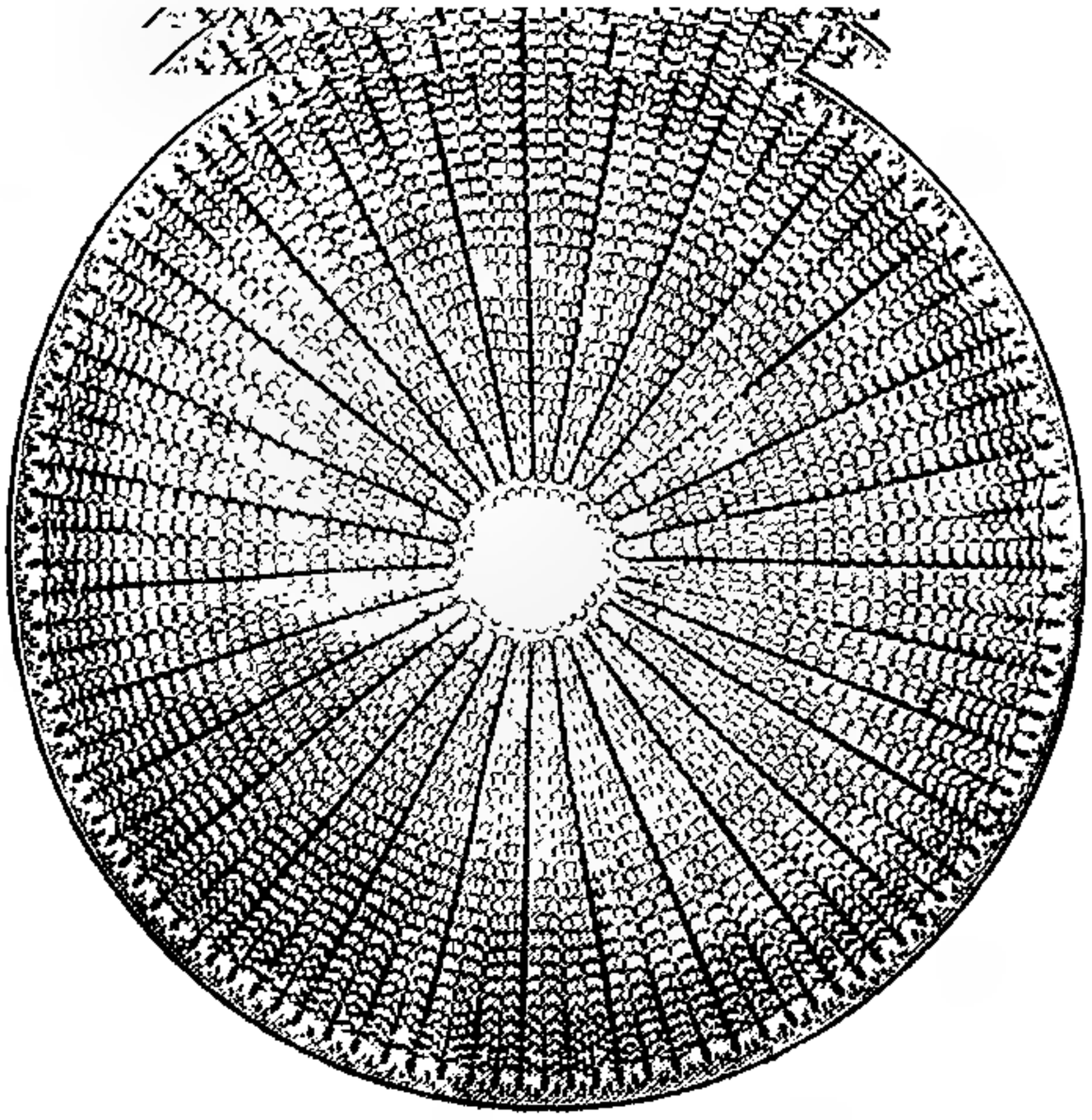
Triceratium (x 160) in different forms; from Oamaru.

A fossil Triceratium (x 145) from Sendai, Japan. ➔



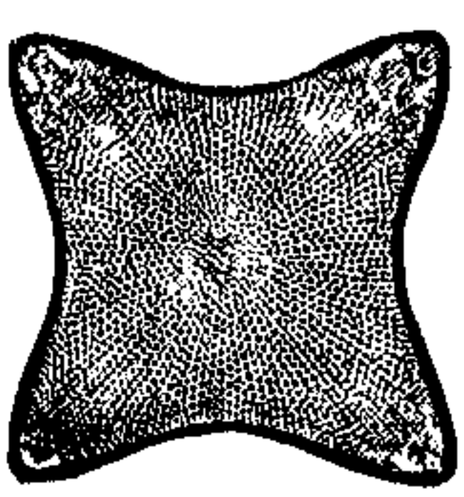


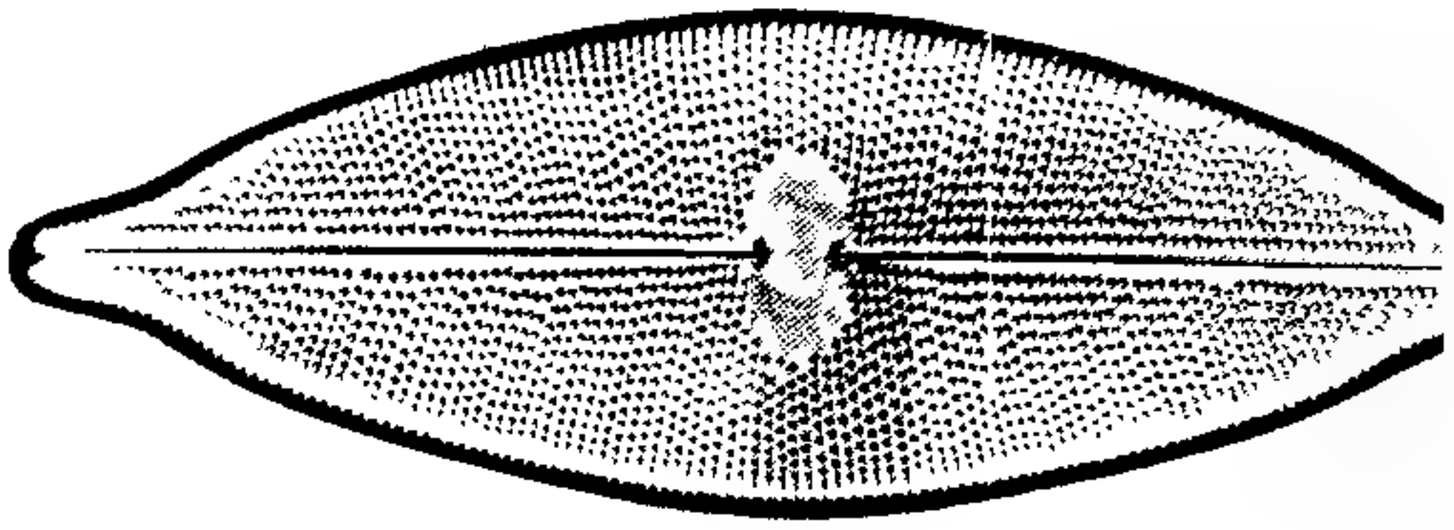
Actinoptychus heliopelta (x 260), a



oidiscus (x 260), named from the spider web which it resembles.

Rhabdonema adriaticum (x 400), a filamentous marine diatom. ➔





Navicula maculata (x 400), a living form from brackish w

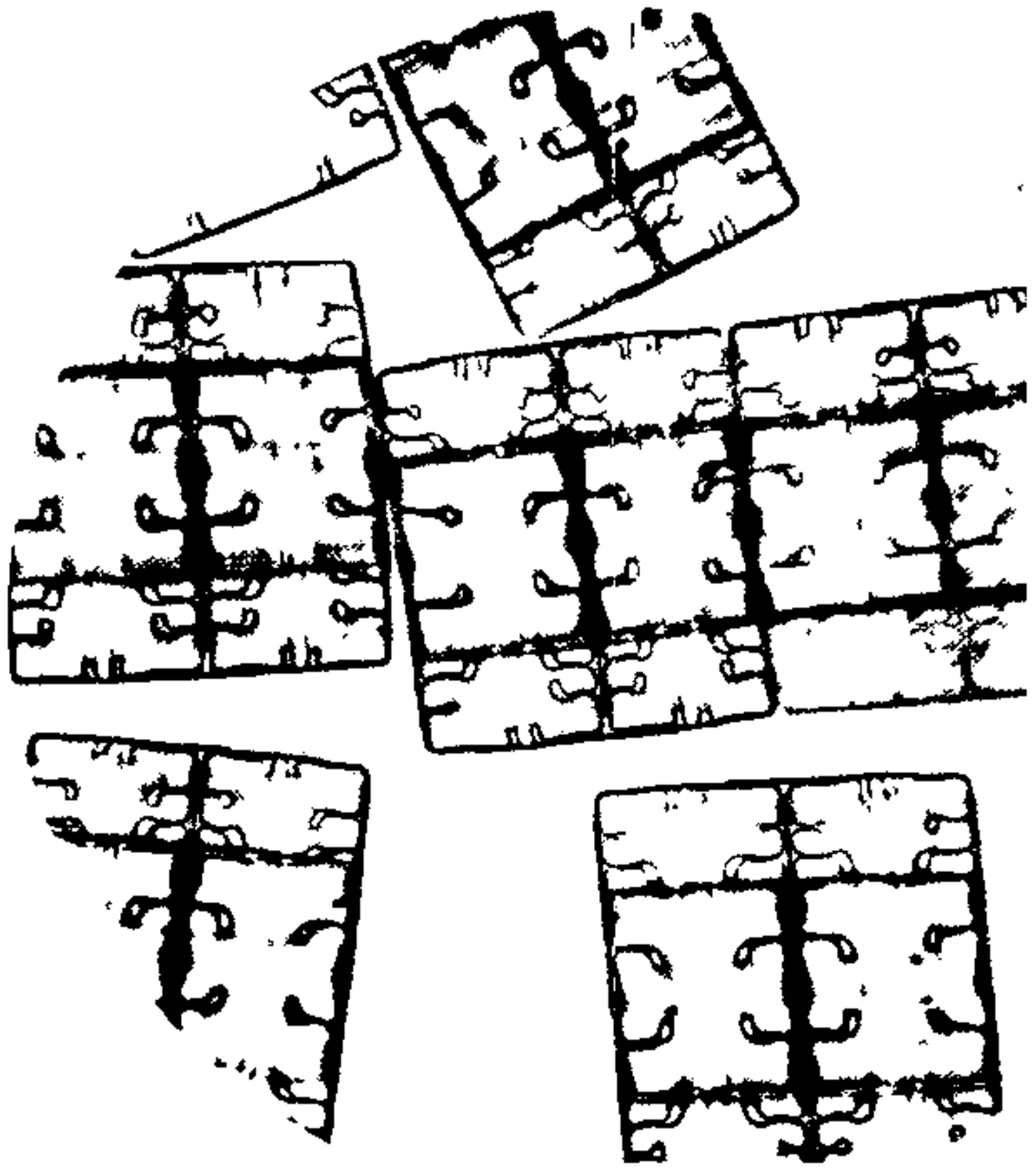
LIVING AND FOSSIL DIATOMS OF THE WORLD

The illustrations reveal not only the varied beauty and form of these microscopic plants, but also their wide distribution both geographically and in time. Their natural appearance is retained in Licmophora and Meridion. The other illustrations show the diatoms prepared for scientific study.

Photomicrographs by Philip O. Gravelle.

In the corner circles:

(Left) Meridion circulare (x 440), the filaments of which grow in a spiral.
(Right) Terpsinoë musica (x 165), collected by
Robert H[illegible]



been resorted to when sprays have failed. One important precaution is to buy no plants which show infestation.

Aside from the scale problem, the wintercreepers offer no cultural difficulties. All of them root very easily from cuttings; being fine-rooted, they can be transplanted at any season during which the ground is open. Sometimes in severe winters their young stems may freeze back or their foliage may get burned, but pruning or the unfolding of new leaf buds takes care of such troubles in spring. All factors considered, it is little wonder that the wintercreeper has become a welcome and useful nursery commodity.

Winter Lectures At The Garden

Jan. 4 ***Autumn Color in Flowers and Trees***
With Kodachromes and Motion Pictures
Clyde Fisher, Curator-in-Charge, Hayden Planetarium

Jan. 11 ***The Beauty of the Diatom World***
Joseph F. Burke, Honorary Curator of Diatomaceae

Jan. 18 ***House Plants for Winter Windows***
Mrs. Jerome W. Coombs, Author and Lecturer

Jan. 25 ***Scenery and Gardens in Bermuda***
Fred J. Seaver, Curator

Feb. 1 ***Color in Our Winter Woods and Fields***
Rutherford Platt, Plant Explorer Photographer

Feb. 8 ***Flowers the Year Around***
A Motion Picture of the Botanical Garden

Feb. 15 ***Getting Acquainted With Lichens***
John W. Thomson, Jr., Director of Staff, School Nature League

Feb. 22 ***Yeast—A Billion-dollar Microscopic Plant***
A Motion Picture and Lecture
George Kirby, Research Chemist, Fleischmann Laboratories

Mar. 1 ***Perennials in the Garden***
Henry Downer, Vassar College

Mar. 8 ***A Botanist Looks at the West***
Stanley A. Cain, Fellow, Guggenheim Foundation

Mar. 15 ***Plants of the Bible***
H. N. Moldenke, Associate Curator

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mixing, it should be remembered that the same water figures in the dilution of the two different chemicals at the different ratios stated. Two similarly spaced applications of the same summer combination should be put on in August to interfere with the comfort of a later hatching. All spraying must be done with extremely high pressure equipment.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

A Widening Field in Plant Pathology

INSECT TRANSMISSION OF PLANT DISEASES. J. G. Leach. 615 pages, illustrations, appendix, glossary, index. McGraw-Hill, New York. 1940. $6.

The increasing amount of evidence of the importance of insects as agents in the dissemination and development of plant diseases during the past quarter century has created a real need for an adequate summarization and co-ordination of such evidence, heretofore available only in widely scattered publications. Dr. Leach has successfully undertaken this difficult task and made an important contribution to the sciences of plant pathology and entomology.

In the past, plant pathologists have been inclined to avoid a study of insects associated with diseases, choosing to leave such insect-disease studies to be worked out by the entomologist; on the other hand, the entomologist has also been inclined to avoid any problem that might involve a mycological or bacteriological study. This attitude has been instrumental in delaying for many years the discovery of important facts of insect-plant disease relationships.

The introductory chapter, which emphasizes the need for further studies in this field, is followed by chapters on the inter-relationships of plants and insects, symbiosis between insects and micro-organisms, and the relation of insects to the spread and development of plant diseases. These chapters bring together in well-organized fashion related information distributed in texts of several branches of biological science. More specific are the chapters on plant diseases caused by toxicogenic insects, insects and bacterial diseases, insects and fungous diseases, insects and virus diseases (two chapters), insects and phytopathogenic protozoa and a chapter on mites, nematodes, and other small animals as vectors of plant diseases. In these chapters, the author has chosen to discuss only those diseases which have been most completely investigated or which seem to be the best suited for illustration of the various principles of insect transmission involved. In the discussion only those facts relevant to insect transmission have been included and information of a general plant pathological or entomological interest has been purposely omitted.

For the convenience of readers with different backgrounds of information and training, the author has included several chapters dealing with such fundamental subjects as the anatomy and physiology of plants and insects, the relation of inocula of plant pathogens to insect transmission, and the feeding and breeding habits of insects in relation to the transmission of plant diseases.

An interesting chapter compares insect transmission of animal and plant diseases. A final chapter deals with methods useful to the study.

The book is well indexed and has a commendable feature in the use of figures in bold-faced type to indicate pages on which illustrations occur. The illustrations are numerous, and well distributed throughout the text. The references at the end of each chapter are comprehensive enough to make the book invaluable from this standpoint alone.

THOMAS LASKARIS.

Thought-provoking Text On Ecology

BIO-ECOLOGY. Frederick E. Clements and Victor E. Shelford. 425 pages, 85 figures, index. John Wiley & Sons, New York and London. 1939. $4.50.

This book is the product of collaboration between two leaders in the field of ecology who have each had approximately forty years of experimental and field experience and who commenced their preparation of the text about a decade ago. Because of their breadth of experience and outlook, it can truly be said that they approach the problems of bio-eco-

logy as biologists, not as a botanist and a zoologist.

It is an almost universal tendency of scientists to cultivate their narrow fields, allowing the hedgerows to grow up through neglect until they can scarcely see from one discipline to another or understand their fellow-worker's efforts. Ecology as a science, which depends so extensively upon all fields of biology as well as upon the physical sciences, has not been free from over-specialization and the too narrow point of view. The reviewer's close connection with the Ecological Society of America has led him to the conclusion that there are almost as many kinds of "ecologists" as there are members of the society. And anyone can verify this conclusion by an inspection of the journals publishing ecological papers. Yet, of all the biological fields, ecology is paramountly one which demands synthesis, broad knowledge, and basic integrating principles.

The general plan of the book is essentially that of the senior author, who had most of the basic materials organized before the collaboration was undertaken. To say that 228 pages of the text are concerned with a restatement of the relations of the community to the environment, of reaction (the influence of the community on the habitat), of coaction (the interrelations of organisms), of development, and the nature of the climax, is not to mark the book as a "rehash" of Dr. Clements' earlier writings, for both animal and plant materials are used for illustration.

Some forty pages are devoted to a discussion of the North American grassland biome. It is here that one finds a convincing description of an extensive, complex, and important formation illustrating the concepts elaborated in the first part of the book. It is through such applications of dynamic ecology that the Clementsian "philosophy" proves itself to be an elucidation of natural processes and really a *science*. It is to be regretted that space (and an insufficient knowledge of animal relations) prevented the inclusion of similar treatment for other biomes such as the deciduous forest of the eastern states. One feels safe in anticipating a more rapid conversion to dynamic bio-ecology as the literature based on the dynamic point of view increases in amount.

Bio-Ecology is a thought-provoking book. Too, it is a stimulating book—which contrasts strongly with the usual book—that should be fruitful of pro tive field research for years to c It is a book which no ecologist, for own sake and for sake of the futur the science, which is the more impo consideration, can afford to ignore. honest study of the principles elucic together with a field search for evid of the processes in vegetation sh convince anyone of the soundness of dynamic approach -in fact, that it is only scientific approach to the commu worthy of the name.

Professor Shelford contributed of the materials of the remainder of book, about 100 pages, which deal fresh water and marine biotic c munities and include the extensive l ography. He also played a large pa the grassland chapter.

STANLEY A. CAIN, *Fe*
John Simon Guggenheim Mem
Founda

Two Books About Trees

TREES. Samuel Rawlins Ste 201 pages, illustrated. Cecil Bau Co., Dallas, Texas. 1940. $3.

The author, who is a technician in bering, has combined in one small vo a diversity of subjects the relation of some of which is difficult to exp The chapter headings begin with Growth and Distribution, continue History of Saw and Sawmilling, proceed through the subjects of Sh age, Why Grade Lumber, Sign Lang Used in Lumbering (illustrated sketches), Good Lumber and Good struction a Safe Investment in Com Species Contributing Most to M Comfort, Famous Trees in History, forestation, Forest Fires, Soil Erc and Odd Facts Concerning Trees. bark-like binding and the grained papers are decorative, but the rough p used inside serves better for the than for the offset photographs.

HOW TO DRAW TREES. Gr Brown. 32 pages of text, 31 p Studio Publications, New York. $1.

This is a small book, illustrated pencil sketches giving general tree acters with occasional details of l and buds. It is designed rather fo beginning student in drawing; not a for the botanical illustrator.

CAROL H. WOODY

The Story of Yellowstone

YELLOWSTONE NATIONAL PARK, Historical & Descriptive. Hiram Martin Chittenden. 8th printing; revised by Eleanor Chittenden Cress and Isabelle F. Story. 286 pages, illustrated, indexed. Stanford University Press. 1940. $3.

This is an excellent account of the history of Yellowstone National Park, written by a man who spent nine years there, during which time he laid out and constructed about 400 miles of the mountain roads which now constitute the park's highway system. It tells of the discovery of the region, the early explorers, legends which have grown up around these characters, and the origin of the many place names in and around the park area. It is to be regretted that the sections on the "fauna," "forests," and "flora" of the park are not more detailed and accurate.

H. N. MOLDENKE.

A Condensed Encyclopedia on Weeds and Their Seeds

WEEDS AND WEED SEEDS, Common, Noxious, and Poisonous, with Commonly Used Crop Seeds. 74 pages, illustrated, indexed. Seed World, Chicago. 1940. $1.

The amount of information in this thin paper-covered book is astounding. A few pages of text treating weeds as second only to erosion among agricultural problems are followed by sections on Noxious Weeds, Lawn Weeds, Poisonous Plants, and Crop and Weed Seeds. The 41 full-page illustrations for the first three sections, prepared by the W.P.A. at the University of Minnesota, show the entire plant with its root system as well as details of inflorescences, individual flowers, leaves, fruits, seeds, and significant stages of growth. Descriptions were provided by the Illinois Department of Agriculture.

Fifteen plates, each containing 24 squares, show the seeds of 360 weeds and common crop plants, both enlarged and natural size. Credit for these is given to the Bureau of Plant Industry of the U. S. Department of Agriculture. The index to illustrations gives both common and botanical names.

Except that it would be impossible in so small a space to mention all of the unwanted plants, the book leaves this reviewer with a feeling of satisfaction that the job of compiling has been well done.

CAROL H. WOODWARD.

Current Literature At a Glance*

By Virgene Kavanagh

Lawns. Problems such as the development of lawns on subsoil, the improvement of surface soil for lawns, the time of seeding, the rate of seeding, and seed mixtures are discussed and some of them solved in "Lawn Experiments" from the Ohio Agricultural Experiment Station at Wooster, Bulletin 613.

Ivies. After a lapse of six years Alfred Bates has resumed his series of articles on "The Illusive Ivy" in *The National Horticultural Magazine* for Oct. 1940. He has included photographs of potted plants as well as leaf drawings of the forms which he describes.

Zinnias. State flower of Indiana, the zinnia, can be grown under a wide variety of conditions. E. R. Honeywell discusses varieties, cultivation and pests in Circular 263 of the Purdue University Agricultural Experiment Station, Lafayette, Ind.

Parks. Three more bulletins of the National Park series—"Acadia", "Shenandoah", and "Great Smoky Mountains" have been issued by the U. S. Department of the Interior.

Insects. "Protecting Shade Trees from Insect Damage" is the title of a valuable 59-page bulletin issued as Circular 509 of the Illinois Agricultural Experiment Station. Two dozen trees and the insects which attack them are described briefly, then the injuries which they produce and the treatment to control these insects are given.

Peat. Since 1866 or earlier New Jersey bogs have furnished peat which has been used extensively as a soil fertilizer, according to Selman A. Waksman, who writes on "Peat and its Uses" in New Jersey Agricultural Experiment Station Bulletin 681, New Brunswick. The bogs themselves, some of which are 10,000 years old, can be used for crops after they have been drained. Peat is also used as mulch, as litter for stables and poultry houses, and for starting seeds and cuttings and growing some types of plants.

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* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

Dutch Elm Disease. Even though latest reports give encouragement to those who are concerned with the battle to save the American elm from the Dutch elm disease, the fight cannot be won unless the work is continued conscientiously. Cornell's Bulletin 437 is therefore most welcome, for it tells the layman much that he needs to know about the symptoms, effects, and means of control of the disease.

Notes, News, and Comment

Winter Courses. The new term in the Science Course for Professional Gardeners opens Monday evening, Jan. 6, with Dr. A. B. Stout teaching Plant Breeding at 7:45 p.m. and G. L. Wittrock teaching Economic Botany at 8:50 p.m. each Monday evening for 12 weeks. Fees for these two subjects are $5 each. Students who can qualify as professional gardeners may enroll for either or both of these subjects without being obliged to register for the entire two year course.

On Thursday evening, Jan. 9, Joseph W. Tansey, Greenhouse Foreman, will commence a series of 12 lectures in Cultivation of Greenhouse Plants in the Two-year Course in Practical Gardening. The class will meet weekly at 7:45 p.m. The fee for the term is $10. Students may also enroll for this term of study independently of other terms, but before enrolling for the spring term of Indoor Gardening Practice, they must have completed satisfactorily the work in Cultivation of Greenhouse Plants.

Members of the Garden are permitted to take courses for which they are eligible up to the amount of their membership fee. Students in the courses whose fees amount to ten dollars may have this sum applied to membership, in return for which they receive all the privileges of members without any additional payment for the instruction.

A copy of the complete Educational Program of the Garden will be sent free upon request.

Life Member. Henry Hicks, of Westbury, Long Island, who has been one of the leading horticultural figures in the East for many years, was made a Life Member of the New York Botanical Garden by the Board of Managers Nov. 7, because of his generous contributions of plant material during the past year.

Phi Beta Kappa. Dr. J. H. Barnhart was elected last month to graduate membership in Phi Beta Kappa by the chapter at Wesleyan University, Middletown, Conn., from which he was graduated in 1892. Initiation will take place next year. Dr. Barnhart was granted a Master's degree there in 1893, an M.D. by Columbia three years later.

Frost. Dahlias at the Garden succumbed to an early frost this year, the week-end of Oct. 19. The chrysanthemums, however, which were just coming into flower, were untouched, and they filled out the autumn season with magnificent bloom, the last of them remaining in good condition until the middle of November, two weeks after the indoor show of chrysanthemums had begun. There were about 3,500 plants of chrysanthemums in more than 70 varieties, and nearly 1,100 dahlias of 440 kinds in the autumn displays outdoors at the New York Botanical Garden this year, in addition to a collection of 65 varieties of hardy asters which formed an outstanding border of bloom during September.

Conference. Dr. H. A. Gleason and John D. Dwyer reported on their field trip of the past summer through the central and eastern states at the conference of the staff and registered students at the Garden Nov. 15.

Zoo. Ten members of the staff of the New York Botanical Garden were guests of the staff of the New York Zoological Park at tea in the Administration Building at the close of the day Nov. 7.

Explorer. Victor Wolfgang von Hagen, who had just returned from nearly a year of exploring in the mountains of Chiriqui Province, Panama, addressed an audience at the Botanical Garden the afternoon of Nov. 2 immediately after the regular Saturday lecture. His subject, illustrated with his own kodachrome slides, was the same as the title of his book which had been published the week before: "Jungle in the Clouds."

Diatoms. Joseph F. Burke spoke on "Diatom Photomicrographs" before the New York Microscopical Society Nov. 1. The following day, under the auspices of the Society, he started work with a Saturday group for the study of diatoms and photomicrography, with the assistance of J. L. Cloud.

Secretary. Mrs. William E. Weber (Lillian Bostock) ended her fifteen years of service with the New York Botanical Garden Nov. 15. She is succeeded in her position of Secretary to the Horticulturist by Miss Lillian Meyferth, a graduate of the Two-year Course in Practical Gardening.

Affiliates. Lectures given during the past month to garden clubs which are Affiliates of the New York Botanical Garden include "Lilies for Gardens" by Dr. A. B. Stout before the South Orange Garden Club Nov. 4 and "The Literature of Gardening" by Elizabeth C. Hall, Garden Club of Mamaroneck, Nov. 25.

Vitamin B_6. At the Autumn General Meeting of the American Philosophical Society in Philadelphia Nov. 22-23, Dr. William J. Robbins spoke on "Vitamin B_6 and Growth of Excised Tomato Roots."

Scouts. The Bronx Committee of Girl Scouts held the annual celebration of the birthday of their founder, Juliette Low, in the lecture hall at the Botanical Garden Oct. 27. Afterward, the 650 girls present visited the tree planted last year at the Garden in memory of Miss Low.

Artists. At the third assembly of the School Art League at the Botanical Garden, Oct. 26, 192 students heard a lecture by George Stonehill, mural painter.

Students. Classes in Horticulture and Plant Materials from the Department of Landscape Architecture at Columbia University, under the direction of Howard R. Sebold, visited the collections of shrubs and evergreens at the Garden Nov. 1 and the Pinetum Nov. 29. From the College of New Rochelle on Nov. 16, 117 students from the biology department came and made a comprehensive tour of the Main Conservatories. Pupils from P. S. 39 in the Bronx visited the conservatories Nov. 8.

Visitors. Among the visitors to the Diatom Room during the present year were John B. Woodward of Bridgeport, Conn., who is particularly interested in the diatoms of his own state, and J. E. Nielsen, President of the State Microscopical Society of Illinois, who is making a study of the diatoms of Lake Michigan.

Orchidist. W. L. Armacost, Los Angeles orchid grower, was a visitor at the Garden Nov. 7. He is known for his contributions to the knowledge of cultural requirements for orchids, as well as for the fine hybrids that he raises.

From the Fair. A polished cypress table made from a cross-section of a tree that was approximately 5 feet in diameter has been presented to the New York Botanical Garden and now stands on the mezzanine in the Museum Building. The legs are made from a heavy three-forked branch of live oak from Florida. The gift was presented by Waldo E. Sexton, in the name of the Driftwood Hotel and McKee Jungle Gardens at Vero Beach, Fla. Mr. Sexton selected the wood and made this and a similar table which were exhibited in the Florida building at the World's Fair. Also from the Florida exhibit came a gift of more than a score of plants, some of which are now on display in the Main Conservatories. Two fine bay trees from the Fair now stand on the mezzanine in the Museum Building.

Botanist. Dr. Theodor Philipp Haas, who was formerly in charge of the Botanical Museum at Nymphenburg, the Botanical Garden of Munich, recently reached America by way of Siberia and the Pacific Ocean, and is now doing independent research at the New York Botanical Garden.

Traveler. Dr. Fred J. Seaver has been making a three-weeks' combination vacation and collecting trip in Bermuda, from where he is expected to return around Christmas-time. He will speak on "Scenery and Gardens in Bermuda" at the Garden's Saturday afternoon lecture Jan. 18.

Mosses. Dr. A. J. Grout, who has recently changed his home address from Vermont to Florida, spent some time at the Garden last month doing preliminary work on the moss family Fissidentaceae, which he will monograph for *North American Flora*.

Fellowship. Dr. Stanley A. Cain, Professor of Botany at the University of Tennessee, came to the Garden the last of November to spend about five months as part of his year of research toward a book on ecology which he is preparing under a fellowship from the John Simon Guggenheim Memorial Foundation.

INDEX TO VOLUME 41

Recurring features, such as Notes, News, and Comment and Current Literature at Glance, will be found in the Table of Contents (page n) but not in the index belo Such items as staff conferences, lists of visitors, and lectures by staff members, also appea ing nearly every month, are not included. Books reviewed are listed under the author names in a separate index beginning on page 303. In the general index, the abbreviati "(rvw)" before a page number indicates a book review. The abbreviation "S" refers Section Two of the May Journal, which contains the Director's Annual Report, a list staff members from the beginning, and the year's publications of the present staff. It paged separately from the rest of the volume. The abbreviation "MS" refers to the Mar Supplement, which consists of the Educational Program of the Garden, also pag separately. An asterisk indicates an illustrated article or the page on which an illustratic occurs. Authors' names are given in parentheses after the title of an article.

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THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Robert H. Fife, Chairman; Mrs. Elon Huntington Hooker, First Vice-chairman; Mrs. Carl A. de Gersdorff, Second Vice-chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

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IN TWO SECTIONS
SECTION TWO

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REPORT OF THE DIRECTOR FOR 1939

I BEG leave to present for the second time the annual report for The New York Botanical Garden. I am pleased to say that there has been definite progress during the past year in all the various activities of the Garden. This is because of the active and unselfish co-operation of all members of the Garden staff, the interest and assistance of the Board of Managers, the Advisory Council, individual members of the Corporation and others and the intelligent and sympathetic support of the City Authorities, in particular representatives of the Department of Parks. With such friendly co-operation much has been accomplished, and I believe that we may confidently look forward to the Garden's becoming an increasingly important factor in the life of New York City and an even greater contributor to the development of horticulture and botany than it has been in the past.

As is true of most institutions, The New York Botanical Garden plays more than one role, and it is necessary for those responsible for its management to see that no one of its functions is sacrificed and that each contributes its part to the entirety which is the Garden. This I believe is being accomplished.

A Place of Relaxation. The Garden is a symbol of peaceful orderliness and a place of relaxation in a busy city and in a world of conflict. Its importance in this respect is an intangible; it cannot be weighed or measured; yet such intangibles are of great significance. Occasionally we have concrete evidence. For example, some time ago we received a donation from a man who stated that visits to the Garden at a critical period in his life had been so important that though in moderate circumstances he wished to indicate his indebtedness by making a small contribution. There must be many similar experiences which never come to our attention.

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York, N. Y. Entered at the Post Office in New York, N. Y., as second-class matter. Annual subscription $1.00. Single copies 10 cents. Free to members of the Garden.

Miss Pearl Buck in her address at the dedication of a plaque honoring Mr. L. C. Bobbink during the Rose Conference last spring said, "In this day when one must speak for so many who are in trouble and distress, for the wounded and orphaned in China and Spain and the destitute and exiled from Germany and Italy, for all those who suffer as the result of man's brutality and madness, it restores the soul to come and speak for roses. It is well in a world like this to remember that in places such as this there are roses."

Col. Robert H. Montgomery also pointed to this aspect of the Garden in his address at the opening of the Tropical Flower Garden, saying that in these highly emotional days we need distractions which rouse new interests. If those without hobbies or outside interests, he emphasized, would engage upon the study of a group of plants it would add ten years to their lives.

For the Pleasure of the Public. To act effectively as a place of recreation and a symbol of all that we associate with a garden necessitates varied and attractive plantings indoors and out, placed in suitable settings and arranged with due regard for the convenience and comfort of the public. As part of the progress that has been made during the past year, new plantings — for example, a cherry walk and a lilac walk — have been installed. Old plantings, such as the Advisory Council border, the annual borders, the dahlias, chrysanthemums, roses, irises, asters and peonies, have been maintained in good condition. Material additions have been made to the arboretum and several hundred rhododendrons have been planted. Parts of the Main Conservatory range have been replanted and rearranged. The winter flower show has been continued. The fencing of the Garden has been nearly completed, and the public lavatories in the Museum and Administration Building were reconstructed. All this maintains and adds to the Garden's ability to offer the public of New York City a garden in a city, with all that this implies.

There are, however, obvious improvements which can and should be made. The rose garden should be moved from its present inconvenient and inaccessible location; there should be further development of the grounds on the west side of the Bronx River by extending plantings south from the main conservatory; a comfort station and a lunch room on the grounds are needed for the convenience of the public; old paths and roads should be resurfaced and because of changes necessitated by the construction

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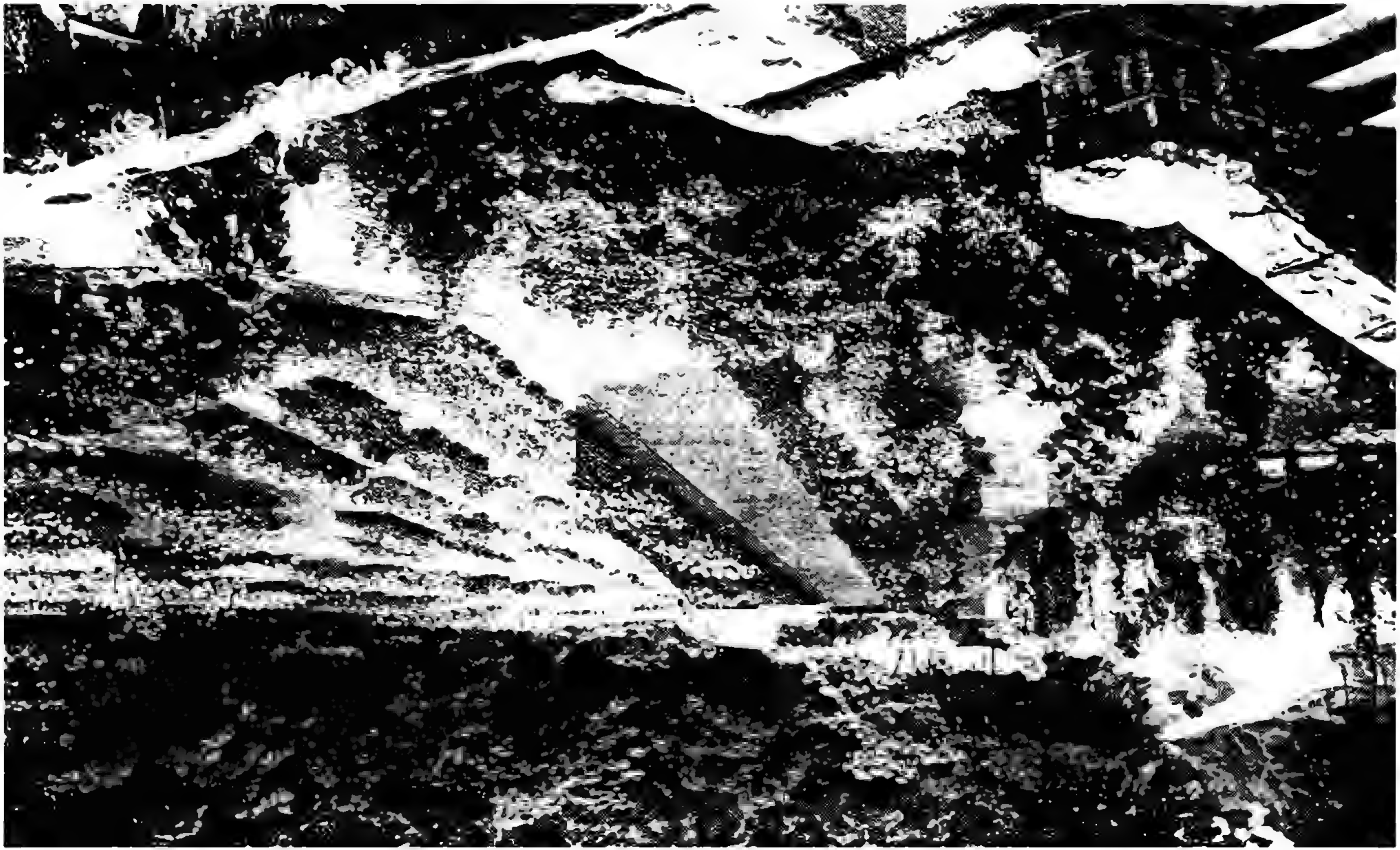
On the opposite page: The Rose Garden, which was the scene of special festivities last June.



of the fence, some new ones should be built; a coolhouse of ample size should eventually be built adjacent to the main conservatory to give more suitable quarters for display. That part of the tropical houses now used for display is ill adapted to the purpose and too small at times to accommodate the number of visitors who come to view it.

In the Educational Field. I am pleased to report also an increase in the effectiveness of the Garden as an educational agency. The Two-year Course in Practical Gardening initiated last year has filled a real need. More than 100 attended the class taught by Mr. Everett in the fall and it is probable that 40 or more students will complete the course and receive certificates this spring. The success of this course is in large measure the result of experiments in adult education initiated at the Garden some years ago with the aid of a grant from the Carnegie Corporation.

The Two-year Science Course for Professional Gardeners has been continued, and our graduates occupy positions which will undoubtedly influence the development of gardening in this country. The Montreal Botanic Garden and Golden Gate Park of San Francisco are developing schools for gardeners on the basis of information and advice secured here by their representatives, and one of our former students is conducting a school for colored gardeners at Dillard University, New Orleans. Exchange relations between Kew Gardens and the Edinburgh Botanic Garden have been discontinued for the duration of the war.

Attendance at the Saturday afternoon public lectures has continued to increase.

Nearly 50 groups totaling more than 2,000 individuals were given special attention by members of the staff on the occasion of their visits to the Garden.

A new course in Field Botany, especially for teachers, was initiated during the past year and gives promise of meeting a need not hitherto taken care of by the Garden program.

Two faculty members from midwestern universities chose to spend their sabbatical leaves at the Garden, and numerous others have spent shorter periods of time with us. Several graduate students are doing research under the supervision of members of the staff. It is encouraging that the Garden is able to meet so satisfactorily a demand for instruction in gardening, horticulture and botany for which it is uniquely fitted.

Our facilities for formal educational work are not entirely adequate, however, and our staff is too limited to permit indefinite expansion in this direction. A rearrangement of space in the Museum and Administration

Building which improves the accommodations for instruction is now under way. In time adequate quarters for the instructional work should be provided either by the enlargement of the building or by remodeling the attractive stone building known as the Snuff Mill and making it a center for adult education in gardening and related subjects.

Let me call your attention also to the Garden as a source of information in an almost infinite variety of subjects related to horticulture and botany. The librarian and assistant librarian, the bibliographer and assistant bibliographer, as well as other members of the staff are increasingly occupied in replying to inquiries and in furnishing information. The majority of such inquiries come from New York City, as might be expected, but numerous requests have been received from elsewhere. Lists of books for new libraries in Argentina, Canada and Florida were furnished, plants were identified, questions on culture and diseases were answered, sources of horticultural or commercial plant materials indicated, and many requests for specific information on botany and gardening were given attention.

Another service feature of the Garden is the distribution of plants. Last year nearly 12,000 were given to the New York City schools while 9,000 more went to hospitals, universities and other institutions and to individuals.

The increased interest in the Journal of the New York Botanical Garden is gratifying. Subscriptions during the past year doubled and more than 2,000 individual copies besides 1,000 reprints were distributed through authors and individual sales.

In the World of Science. The scientific activities of the Garden have continued in various directions though definitely limited because of restricted income. Two numbers of North American Flora and one number of Brittonia, the latter of 244 pages, and numerous papers in periodicals were published. Dr. Gleason and Dr. Smith continued their studies on South American flora; Dr. Camp is approaching the conclusion of his studies on blueberries intended for publication in North American flora; Dr. Moldenke will soon have a manuscript on the Verbenaceae of North America; Dr. Seaver has continued his studies on the fungi, especially of Colorado and the Bermudas. Dr. Stout has been engaged in problems of breeding, cytology and incompatibilities in *Petunia, Lobelia, Convallaria, Iris, Lilium, Hemerocallis* and *Vitis*. Mr. Degener continued his studies of Hawaiian flora. Dr. Dodge has devoted part of his time to genetic studies of the fungi. Fundamental studies carried on in part at The New York Botanical Garden on thiamin (vitamin B_1) and similar

substances as means of promoting growth of plants have resulted in considerable public interest in their possible usefulness in horticultural practice. Under the supervision of Dr. Dodge Mr. Thomas Laskaris has been engaged in a study of root rot of *Delphinium*, supported by a fellowship from the American Delphinium Society. However, almost no botanical exploration was carried on during the past year, and it was also impossible to finance the completion of a flora of southwestern United States left in an unfinished condition by Dr. Small. Our collection of fossil plants, one of the best in the United States, is still without a curator, and Mr. Williams' failing health leaves our moss herbarium, the largest collection in America, without a caretaker. In fact, our taxonomic staff has been materially reduced during the past twenty years and is reaching a point where serious consideration must be given to increasing it.

Details on various aspects of the activities of the Garden follow.

Buildings and Grounds

In addition to routine maintenance numerous improvements have been initiated or completed under the supervision of Mr. A. J. Corbett, Superintendent, and Mr. A. C. Pfander, Assistant Superintendent of Buildings and Grounds.

The reconstruction of the cornice of the Museum and Administration Building, begun in June 1938, was completed at a total cost of $47,936. This reconstruction improves the appearance of the building, removes a hazard endangering visitors and employees, and stops leakage of rain and snow.

The lavatories for men and women in the basement of the building were modernized at a cost of $8,067.

Reconstruction and alterations of the lavatories on the top floor of the building and the comfort station for women on the east side of the grounds were nearly completed at a cost of $6,009.

An information booth was erected near the main entrance on the first floor of the Museum and Administration Building.

The administrative office was redecorated and refurnished.

Reserve publications, numbering several thousands, were removed to the sub-basement under the lecture room, which was suitably prepared to accommodate them, thus freeing valuable space for other purposes.

A workroom for mounting botanical specimens and a classroom were prepared in the basement of the Museum and Administration Building. In making these rooms it was necessary to erect partitions and make changes in the heating system.

Electric wiring of the Snuff Mill, giving power and adequate light, was about completed under the Work Projects Administration.

A small unheated greenhouse 12 x 60 feet standing near the stables was demolished and re-erected on the north side of the propagating range No. 2. This house is to be used for experimental purposes.

Fencing the Garden by the Work Projects Administration under the supervision of the Department of Parks was nearly completed. This involved the erection of 4,200 line feet of wrought iron fence, 8,000 feet of chain link fence, and the building of 128 granite and 4 limestone piers. A gatehouse at the main entrance was partly completed.

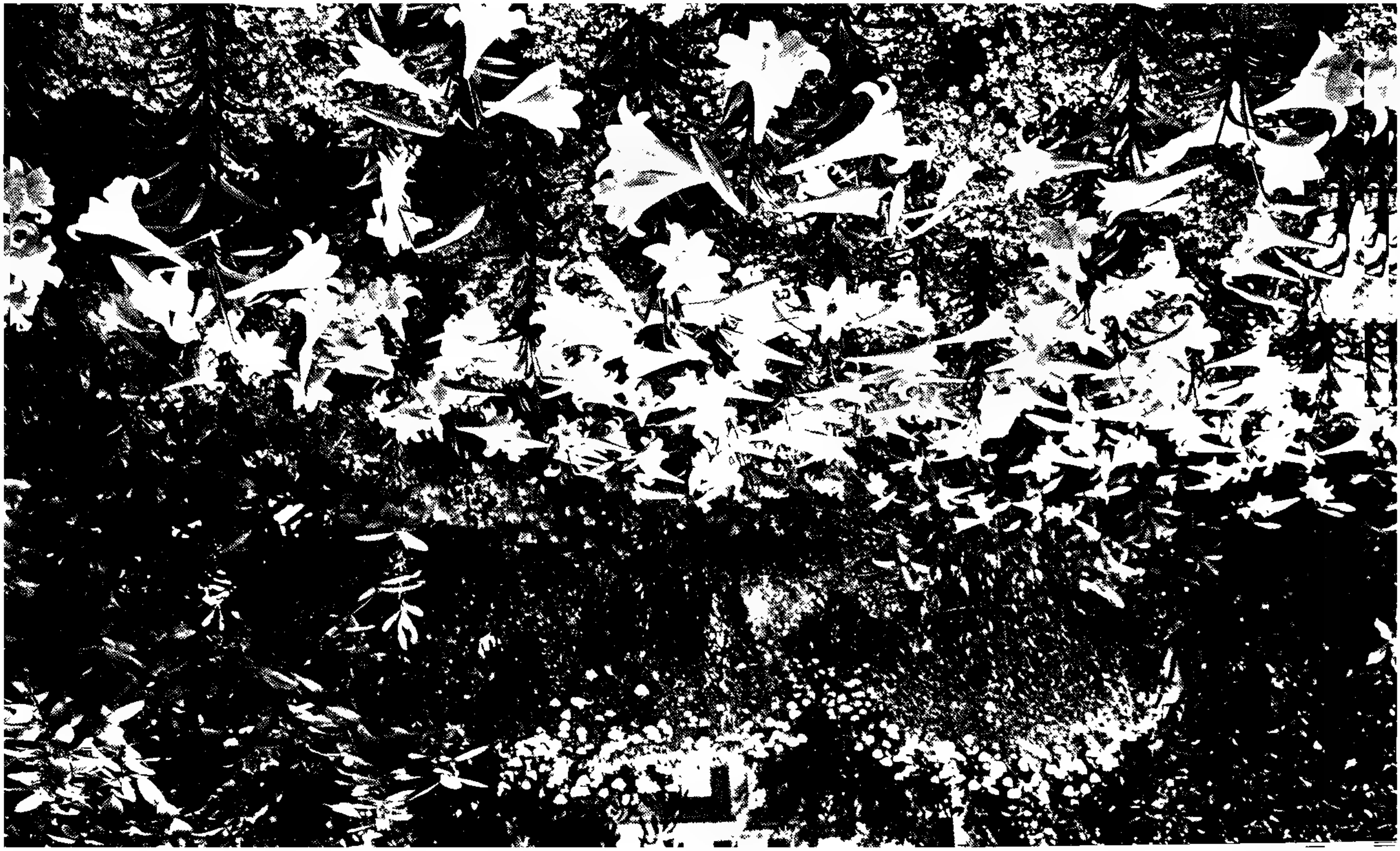
The grounds and buildings were effectively protected and guarded by police officers assigned to that purpose and further by our own keepers and employees. Because of the vigilance of the men who patrolled the grounds, damage and nuisances were kept at a minimum.

Routine maintenance of buildings and grounds involving items too numerous to mention was continued.

Living Plant Collections and Displays

Under the direction of Horticulturist T. H. Everett and with the active assistance of P. J. McKenna and others, the living plant collections and displays have shown notable improvement.

Indoor Plantings. The reconstruction of the Main Conservatories has made it possible to replant the various houses there. It is the general plan to rearrange the collections so that each house has a definite character of its own and to set out the plants so far as possible in naturalistic style. In accordance with this plan Houses 6, 7 and 8 are now devoted to succulents of the Old and New Worlds, House 4 has been planted in gardenesque style as a setting for winter flower displays, and House 12 has been arranged to give the impression of a tropical rain forest. During the past year House 5 has been given over to a display of begonias, our collection of which now numbers 359 species and varieties. House 10 has been planted chiefly with aroids, House 11 with ferns, and 13 has been rearranged as a tropical flower garden with all the plants (225 distinct kinds) set in the ground. The main feature of the design is a formal flagged walk flanked by borders of mixed flowering plants. A bronze statue "Wildflower" by Edward Berge, lent by the Grand Central Art Galleries, stands at the end of the walk. When the result is viewed it is easy to forget the thought, planning and labor involved in these changes. For example, arranging the Tropical Flower Garden required the handling of 68 truck loads of soil, sand, cinders, leafmold and manure and the



installation of 6 tons of rock and 1,000 square feet of dressed flagstone path. It is obvious that only a limited amount of such extra labor can be undertaken in a single year. Houses 1, 2, 3, 14 and 15 still remain to be replanted.

For the winter flower display in House 4 during the 1938–39 season, 8,686 plants representing 573 species and varieties were used. The public interest in these flower shows continues, and at times visitors overcrowd the space available.

Range 2 has continued to serve a useful purpose for propagation, for housing the pelargonium and orchid collections, for courses in practical gardening and numerous other incidental activities.

Outdoor Plantings. Among the 2,950 plants and 3,900 bulbs set out in the Thompson Memorial Rock Garden were 390 species and varieties new to the Garden. In addition 1,500 plants and bulbs have been planted in the Wild Flower Garden. May I emphasize the constant care and meticulous attention to detail necessarily given by the Garden staff to maintain this large collection of plants in satisfactory condition.

In preparation for a spring display 37,650 tulip bulbs were planted in the Conservatory Court and adjacent areas, and 3,500 Narcissi were planted in the meadow within the Rock Garden enclosure.

The hardy and tropical waterlilies provided an excellent display during the blooming season.

The unusual cold on Thanksgiving Day 1938 following a spell of mild weather caused considerable damage in the Rose Garden and necessitated heavy replacements in the spring. The total replacements numbered 2,695 plants in 286 varieties. These figures include 158 plants in 58 varieties arranged as a special border of old-fashioned roses, a feature which adds much to the interest and educational value of the Garden.

Under the immediate supervision of Mr. Pinkus, considerable attention has been given to the development of the Arboretum which is planned to be as comprehensive as possible yet arranged with consideration for esthetic values. During the past year 3,186 plants were set out in the permanent collections and of these 474 were species and varieties new to the collections; 3,480 plants were transplanted in the nursery; 2,236 plants were transferred from propagating houses into nursery beds; 10,600 ground-cover plants were set out. It is not possible to specify in detail the plantings in the Arboretum. An inventory taken in February indi-

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On the opposite page: Easter lilies in the Floral Display House during April.

cates our collections of trees and shrubs to be in excess of 2,025 species and varieties.

Labels are a constant and necessary expense. More than 3,000 labels were made during the past year of which 23 were large and informational in character.

Gifts and Exchanges. Plants of the Mikado daylily, of *Achillea tomentosa* variety **King Edward,** and of *Veronica spicata rosea* were offered Garden members. Plants disposed of in other ways numbered more than 21,000, of which nearly 12,000 went to 37 New York City schools and 9,000 to other institutions and organizations, including the Catholic Medical Missionary Board, Rikers Island Penitentiary, Ellis Island, New York Institute for the Blind, Bronx House, Metropolitan Hospital, the Jennie Clarkson School, the New York City Park Department, Letchworth Village Mental Hospital, and to other botanical gardens and many universities.

In our seed exchange 5,081 packets were sent to 140 botanical gardens and similar institutions throughout the world, and we requested and received 873 packets. The 1939–40 seed list will include 467 items.

The cultivated herbarium was increased by 748 specimens to a total of 22,427.

Special Displays and Exhibits. An exhibit consisting of 24 hardy waterlilies, 14 tropical waterlilies and 14 miscellaneous aquatic plants was maintained at Gardens on Parade at the World's Fair. A display of specimen begonias was awarded a Silver Medal Certificate by Gardens on Parade. The New York Botanical Garden was one of the sponsoring organizations for Gardens on Parade.

In co-operation with the Park Department an exhibit illustrating certain phases of the Garden's activities was maintained in the City Building. This included a life-sized activated model of *Amorphophallus titanum*.

A special exhibit of labels was prepared for the Shade Tree Conference held in New York City in August.

A notable exhibit of begonias at the International Flower Show in March received a special prize of $250, the Gold Medal of the International Flower Show for an Educational Display, and the Sarah Tod Bulkley award of the Garden Club of America, made in recognition of the great variety and high horticultural merit and the beauty of the display.

Gifts Received. Important gifts of living plant material were received during the past year. It is not possible to list all the donors but special mention should be made of the following:

Much work has been done in the Arboretum during the past year. This is one of the Garden's splendid specimens of the native American elm, Ulmus americana.

Dr. L. Horsford Abel, White Plains, New York—170 lily bulbs.
Bagatelle Nursery, Huntington Station, Long Island—46 rhododendrons.
Bobbink & Atkins, Rutherford, N. J.—80 rhododendrons, 2,695 roses.
Mrs. William K. du Pont, Wilmington, Del.—17 orchids.
Mr. James G. Esson, Great Neck, Long Island—12 hollies.
F. & F. Nurseries, Springfield, N. J.—7 rhododendrons.
Holland Bulb Industry, Haarlem, Holland—40,400 tulips, 5,000 narcissi, 2,000 hyacinths.
Hicks Nurseries, Inc., Westbury, Long Island—400 rhododendrons, 100 other shrubs.
Mrs. Christain Holmes, Sands Point, Long Island—180 Calanthe orchids.
William M. Hunt & Co., New York City—1,400 miscellaneous bulbs.
Mr. H. R. Kunhardt, Jr., New York City—28 orchids.
Mr. Clarence McKay Lewis, Sterlington, N. Y.—74 conifers.
Mr. T. MacDougall, New York City—138 plants collected in Mexico.
Princeton Nurseries, Princeton, N. J.—14 rhododendrons.
Mr. Stanley G. Ranger, New York City—273 orchids, 41 succulents, 24 waterlilies, 232 bulbs, 57 shrubs, 9 begonias, numerous seeds and rock garden plants.
Shore Acre Nurseries, Orlando, Fla.—400 Caladium tubers.
C. J. Van Bourgondien & Co., Babylon, Long Island -1,250 freesias.
Vetterle & Reinelt, Capitola, Calif.—140 begonias.
Mr. Isaac Langley Williams, Exeter, N. H.—522 ferns.
Mr. Rudolf Ziesenhenne, Santa Barbara, Calif.—73 begonias.

Plant Diseases

Dr. Dodge and his assistants have controlled the diseases and insects of the Garden with their usual success. For the first time some damage to roses was done by the rose midge and serious trouble developed with rose thrips. Nevertheless, with the application of suitable control measures, excellent bloom was secured in September and October. Less difficulty than usual was experienced with the Japanese beetle, probably because of the dry season and also because of the arsenate applied to our lawns in previous years. The gypsy moth has apparently been entirely exterminated not only in the Garden but in the Bronx. Fine results in controlling eelworm infection in the chrysanthemum borders were obtained by suitable sterilization with formaldehyde. Studies on the natural infection of ornamental plants by the juniper rust were carried out. With the support of the American Delphinium Society, Thomas Laskaris has investigated root rots of Delphinium.

Photography

Miss Fleda Griffith has rendered her usual effective service as Garden Photographer. The Journal, lectures by members of the staff, scientific publications, popular information furnished the press, and various magazines owe much of their effectiveness to pictures and lantern slides made by the photographer. During the past year the following was accomplished: 253 films developed, 1,031 negatives made and developed, 4,634 prints, 196 enlargements, and 463 slides made, and 303 slides colored.

Herbarium

Under the supervision of the Head Curator, Dr. H. A. Gleason, the Mycologist, Dr. Fred J. Seaver, and their assistants, 29,732 additions were made to the herbarium, making its total, exclusive of the collection of fossil plants, 1,963,238, distributed as follows:

Britton Herbarium	1,021,075
Oriental Herbarium	240,471
Local Herbarium	64,719
Cultivated Herbarium	22,104
Mosses	176,999
Hepaticae	61,342
Fungi	258,124
Lichens	31,348
Algae	87,056

The growth of the herbarium has been limited by the continued depression in this country and political difficulties abroad.

The use of the herbarium has continued unabated. Dr. Gleason com-

pleted and published his studies on the flora of Mount Auyan-tepui and a monograph of the genus *Clidemia* in Mexico, as well as shorter papers; Dr. Seaver, in addition to acting as editor of *Mycologia* and co-editor of *North American Flora,* continued his studies of the fungi. Dr. Smith published studies of plants collected by him in British Guiana and completed the study of plants collected by A. S. Pinkus on Mount Roraima. Dr. Moldenke has prepared a manuscript on the Verbenaceae for *North American Flora* and has completed studies of the same family in Trinidad and Tobago, Surinam, and the Yucatan Peninsula. Dr. Camp has continued work on the Ericaceae. Mr. Degener extended the collection and distribution of Hawaiian flora and the publication of his Flora Hawaiiensis. Mr. Alexander has devoted much time to the southern flora and the identification of plants in the Garden and the local flora. Miss Ellys Butler, Mr. Charles Gilly and Mr. John Dwyer have been engaged on research. Numerous botanists visited the herbarium and spent various periods in study. These visitors represented nearly 40 institutions in this country and abroad.

A total of 23,118 sheets was loaned during the past year. These were distributed as 164 loans to 51 institutions.

The rearrangement of the Museum and Administration Building, giving more adequate and convenient space for the herbarium and scientific staff, has been initiated, but the unsatisfactory condition of the herbarium cases has not been corrected.

Roses infested with thrips. This was one of the new pests that threatened the beauty of the Garden's plantings, and that was tackled during 1939 by the Plant Pathology department.

Library

Under the able supervision of the librarian, Miss Hall, and her assistant, Mrs. Schwarten, the library has continued to increase in extent and usefulness. During the past year 865 bound volumes and 2,173 unbound volumes and pamphlets were added, and the library now contains 47,739 bound volumes. Catalog cards were increased by 17,616. The periodicals and continuations received by the library total 774. Minor changes have been made which increase the facility with which the library can be used by staff and visitors; the most important of these is the installation of shelves in the main rotunda to accommodate the current periodicals.

Thirty-six exhibits of books and pamphlets related to the subjects of the Saturday afternoon lectures were arranged during the year, and other exhibits were displayed for visiting student groups and special events such as the Rose Conference, Daylily Conference, Garden Book Week and the Christmas gift season. One hundred and fifty-five written requests for information, chiefly for lists of books, were received and answered during the year. The majority of these requests were received from New York City, but many came from other parts of the United States and foreign countries. In addition, reference work with the public both in the library and by telephone has increased perceptibly. Material assistance was given in the selection of titles for the library of the newly formed Horticultural Society of Argentina and for the new library of the Montreal Botanical Garden. Visitors who registered in the library came from 26 foreign countries and 37 of the 48 states of the Union.

Museum Exhibits

The Museum of The New York Botanical Garden is the only public botanical museum in America. Its usefulness could be materially increased by introducing modern and educative exhibits. It has not been possible during the past year to devote funds to this purpose.

Publications

North American Flora. Two parts of *North American Flora* were published during the year. The first was a continuation of the Grass Family, initiated by G. V. Nash, carried further by A. S. Hitchcock, and now under the authorship of Agnes Chase and J. R. Swallen. The second included additions and corrections to Volume 7, Part 1 by G. L. Zundel, including a host index.

Addisonia. The first number of Volume 21 was published under the editorship of Assistant Curator E. J. Alexander.

Mycologia. The current volume consists of 754 pages with 66 major articles, edited by Dr. Fred J. Seaver.

Brittonia. Edited by Associate Curator A. C. Smith, one number of 244 pages was published.

Journal. The 40th volume of the Journal, edited by Carol H. Woodward, was published.

Monograph on Carex. This monograph, by Kenneth K. Mackenzie with illustrations by Harry C. Creutzburg, is now in page proof and should be distributed shortly.

Miscellaneous Publications. Numerous articles of a technical or popular character were published in journals and magazines, some edited or published by the Garden. These articles are listed on pages 18 to 22.

Bibliographical Work

The importance and extent of the work of the Bibliographer, Dr. J. H. Barnhart, and his assistant, Dr. H. W. Rickett is not always recognized. In addition to the usual routine in connection with the use of the Library and the solution of bibliographical problems, the Bibliographer and his assistant have been occupied with editorial and bibliographical work on the Mackenzie monograph on *Carex* and three numbers of *North American Flora.*

Education

The following formal and informal instruction was given under the supervision of Dr. Stout, Curator of Education and Laboratories, and Mr. Everett, Horticulturist, with the assistance of various members of the staff.

Free Public Lectures. Three courses were offered on Saturday afternoons as follows: Winter course of 11 lectures, spring course of 13 lectures, autumn course of 14 lectures. Attendance averaged 125 per lecture.

Course in Local Flora. The first of two courses, one in the autumn and one in the spring was offered under the immediate supervision of Dr. Camp. Intended primarily for teachers, the initial course comprised a total of 60 hours of study and field work and had a registration of 11.

Botanical Exploration. A course of four sessions in co-operation with the American Institute was given in the late winter and again during the autumn to groups of selected students.

Docentry for Groups. Garden clubs, classes of school children, groups of college students and others have made planned visits to the Garden during the year. More than 2,000 individuals in 54 groups have received special attention on these occasions from members of the staff.

Lectures by Members of the Staff. As in the past numerous lectures of both popular and of technical character have been given by members of the staff to various organizations.

Two-year Course in Practical Gardening. Organized last year, the evening classes in practical gardening have proved increasingly popular. The winter term of 12 lectures in Indoor Gardening and the spring term of 8 sessions in Indoor Gardening Practice (Laboratory), both taught by Mr. Joseph Tansey, Greenhouse Foreman, brought a registration of 59 and 27, respectively. The following autumn term of 12 lectures on Fundamentals of Gardening, under Mr. Everett's instruction, had an enrollment of 102.

Two-year Science Course for Professional Gardeners. For the winter term which began January 9, 36 students registered for Plant Breeding given by Dr. Stout and 37 for Economic Botany under Mr. G. L. Wittrock. The fall session began on October 2 with a registration of 35 in the class in Plant Morphology taught by Dr. H. W. Rickett and 37 in Dr. Moldenke's class in Systematic Botany A. Fourteen students were graduated April 17, the principal address being given by Mr. Clarence McKay Lewis.

Graduate Work. In accordance with the co-operative arrangements with Columbia and Fordham Universities, five students were registered for graduate work and Prof. William J. Bonisteel completed the requirements for the degree of Doctor of Philosophy under the supervision of Dr. Stout. One teacher worked on the cytology of *Lilium candidum* and five individuals received scholarships of one or two months. A special scholarship of the American Delphinium Society was awarded Mr. Thomas Laskaris.

Staff Membership

Last year a list was published of Members of the Board of Managers since the initiation of the Garden. This year a list is published of members of the staff from the beginning. During the past year Mr. Percy Wilson retired, assuming the title of Research Associate, and Dr. H. W. Rickett was appointed Assistant Bibliographer.

Garden Membership

The total membership is 1,034, classified as follows: Annual, 860; Sustaining, 56; Life, Benefactors or Patrons, 103; Garden Clubs, 15. A complete list of members is appended.

Finances

Beginning July 1, 1939, the City of New York changed its fiscal year from one running from January 1 to December 31 to one extending from July 1 to June 30. The Garden has made a similar change, and no statement of finances will, therefore, be included in this annual report. However, there will be published in the annual report for 1940 a complete financial statement for the 18 months' period—January 1, 1939 to June 30, 1940.

I may add that because of the attention given by the Finance Committee to the investment of capital funds the endowment of the Garden is unimpaired and that under the supervision of the Board of Managers and with the personal attention of Mr. H. de la Montagne the expenditures of the Garden have been held within its income.

Work Projects Administration

Assistance of various types has been received from the Work Projects Administration, though its efficiency has been decreased by the lay-offs required by government regulations. A number of employees have secured positions elsewhere on the basis of the training obtained in their work at the Garden. The major activities included the work on the fencing of the Garden under the supervision of the Park Department and numerous projects under the Women and Professional Division, which may be grouped as follows:

1. Mounting, labeling, repairing, and filing herbarium collections.
2. Preparation of labels for the collections of economic plants.
3. Assistance in seed collections.
4. Preparation of an index and file of negatives and lantern slides.
5. Repairing and cataloguing library books.
6. Preparation of an index of the *Gardeners' Chronicle* (London).
7. Assistance in research work and the preparation of illustrations and manuscripts.

Special Events

March 5–11—Special display of books on gardening.

March 13–18—International Flower Show, exhibit of begonias. Two gold medals and special prize.

April 9—Easter display, Main Conservatories.

April 17—Graduation exercises, student gardeners. Speaker, Mr. Clarence McKay Lewis.

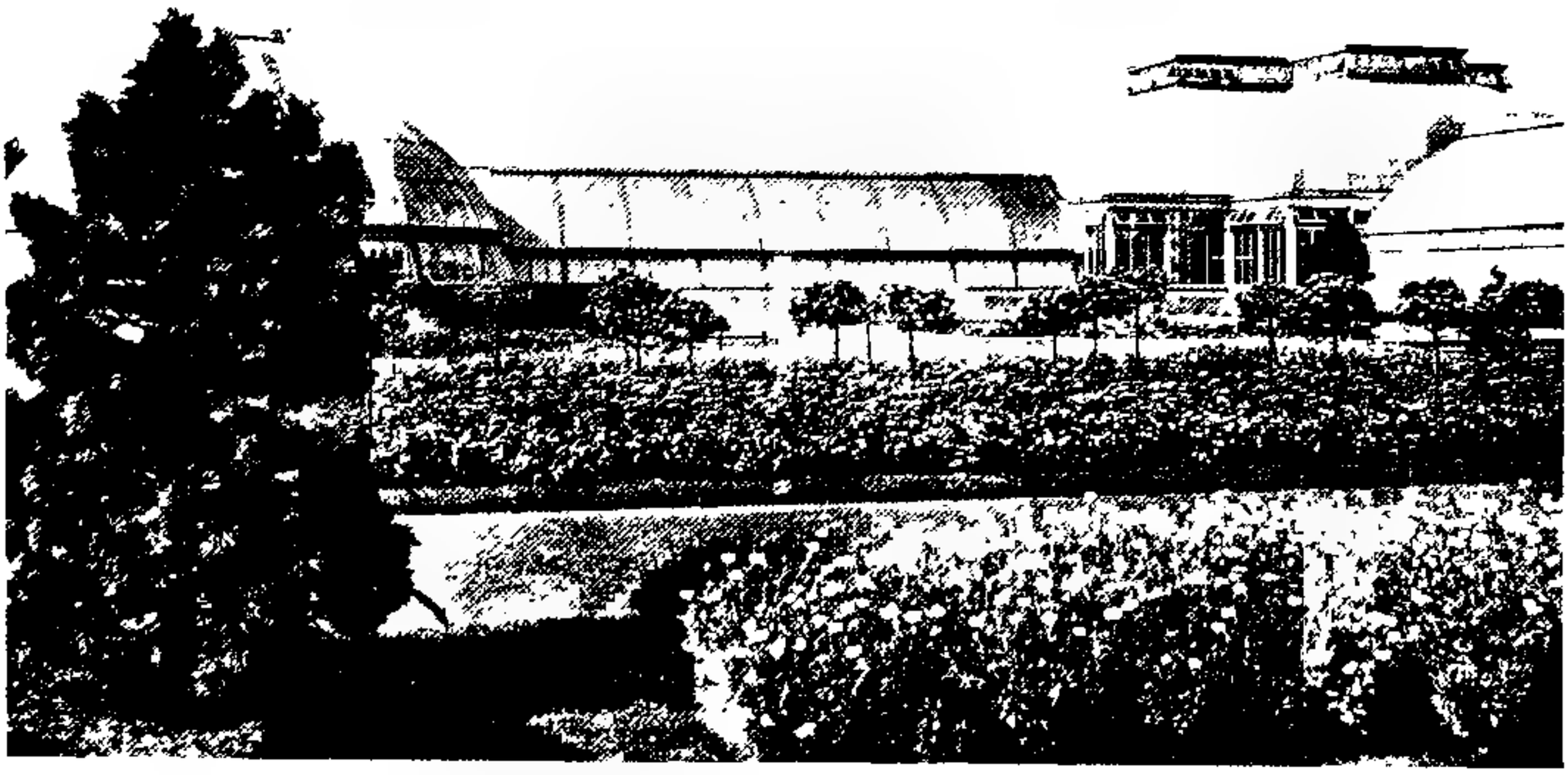
April 22–May 5—Special display of paintings of English gardens by Mary Elwes.

May 6–20—Special display of paintings of under-sea life by Else Bostelmann.

May 6—Observance of 80th birthday of Mr. Robert S. Williams.

May 15—Spring Tea—President, Board of Managers and Advisory Council.

May 20–June 1—Special exhibit of paintings of native wild flowers by Edith F. Johnston.



A color scheme of yellow and purple in the conservatory court during the summer months, created with tulip-poppy, lantana, verbena, and heliotrope.

May 22–23—Members' Days, Rock Garden.

June 6—Display of specimen begonias, Gardens on Parade at the New York World's Fair. Silver medal certificate.

June 6–7—Rose Conference. Dedication of bronze plaque honoring Mr. L. C. Bobbink. Address by Pearl Buck.

June 26–July 1—Daylily Week.

July 2—Second specimen of *Amorphophallus titanum* flowered.

July 17—New York Botanical Garden Day, honoring Capt. F. Kingdon Ward, Gardens on Parade, World's Fair.

July 17—Special exhibit of Hemerocallis, Gardens on Parade.

Aug. 22–24—Special exhibit of plant labels, National Shade Tree Conference, New York.

Sept. 16—Special exhibit, living mushrooms.

Oct. 29—Oak tree planted by Bronx Girl Scouts, honoring Juliette Low.

Nov. 3—Formal opening, Tropical Flower Garden. Tea by Advisory Council. Speakers, Col. Robert Montgomery and Mr. Allyn R. Jennings.

Dec. 2–16—Special display of photographs of South American plant life by Dr. V. W. von Hagen.

Dec. 22—Christmas display opened in Main Conservatories.

In closing this report may I again emphasize that only by practising the strictest economy and limiting its activity in many directions has the Garden been able to carry on without a deficit during the past year. Income from invested funds and from private sources has been reduced; yet demands upon the Garden are greater now than ever before. Additional funds for exploration, publication, herbarium additions, scholarships or fellowships and scientific research are badly needed. Improved facilities for the public and the staff should be provided. The needs listed in the annual report of last year exist, though definite progress has been made in satisfying some of them. It is to be hoped that material assistance in the development of the Garden will not be too long delayed.

WILLIAM J. ROBBINS.

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Amianthium muscaetoxicum. Fly-poison. Addisonia 20: 55, 56. *pl. 668.* "10 F" [28 Mr] 1939.
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Lonicera canadensis. Fly-honeysuckle. Addisonia 21: 9. *pl. 677.* "20" [31] My 1939.
Chrysopsis hyssopifolia. Addisonia 21: 11, 12. *pl. 678.* "20" [31] My 1939.
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Cactaceae [from British Guiana]. Lloydia 2: 199–201. "S" [O] 1939.
Compositae [from British Guiana]. Lloydia 2: 217, 218. "S" [O] 1939.

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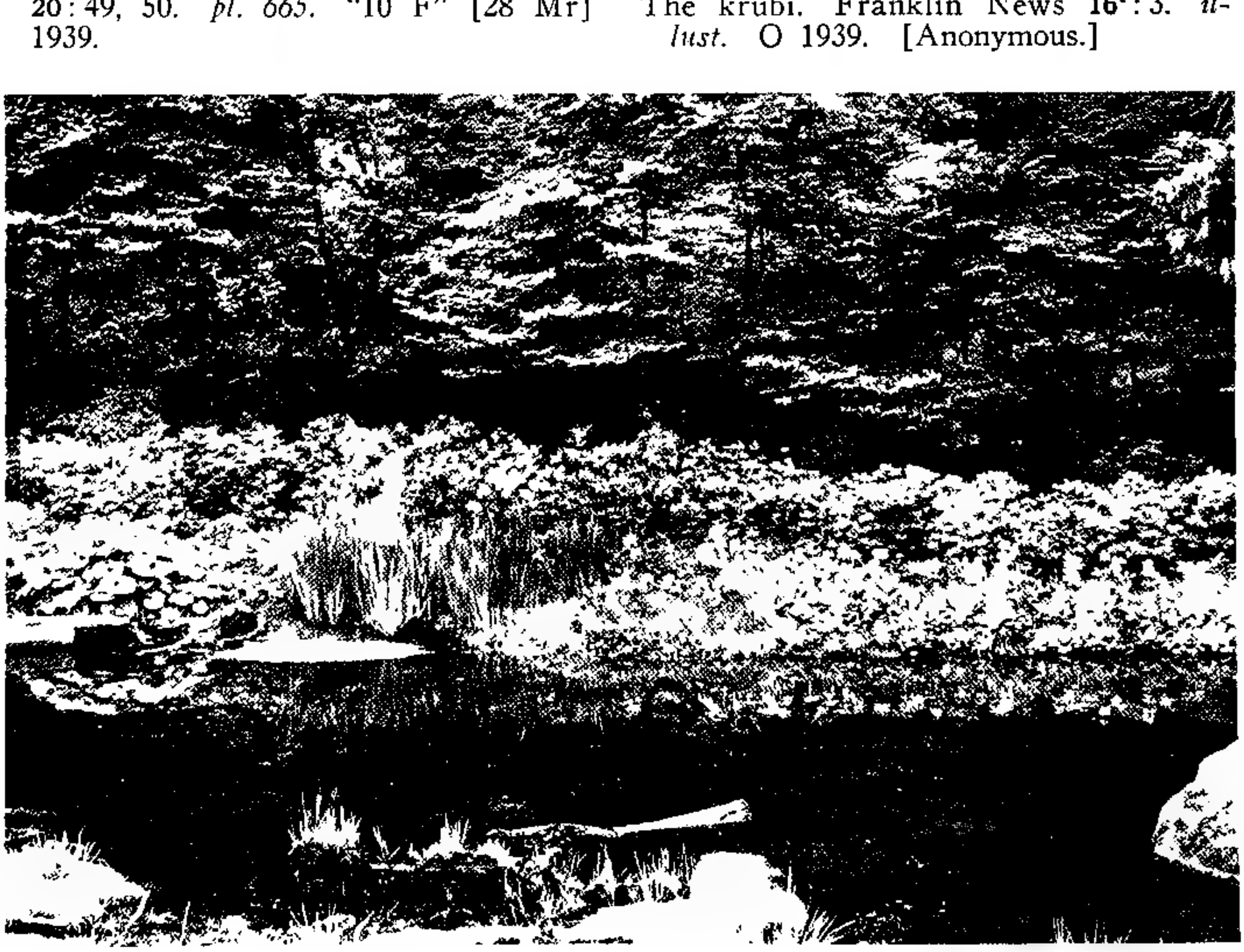
Waterlilies are on display at the Fair and Bronx Gardens. N. Y. Times **88(29744)**: D 10. 2 Jl 1939.

The krubi. Franklin News **16**[4]: 3. *illust.* O 1939. [Anonymous.]



Primulas, azaleas, and irises are among the flowers that bloom at the edge of the bog garden in the Thompson Memorial Rock Garden.

LIST OF STAFF MEMBERS
NEW YORK BOTANICAL GARDEN
1896 TO 1939

Alexander, Edward Johnston.
Museum Aid ..... February 1926 to June 1926
Assistant Curator ..... July 1926 to June 1932
Assistant Curator and Curator of the Local Herbarium ..... July 1932 to date

Barnhart, John Hendley.
Editorial Assistant ..... January 1903 to September 1907
Librarian ..... October 1907 to December 1912
Bibliographer ..... January 1913 to date
Administrative Assistant ..... July 1932 to October 1937

Bastedo, Walter Arthur. *Later professor of clinical medicine, Columbia University.*
Curator ..... June 1897 to September 1897

Benedict, Ralph Curtiss. *Later professor, Brooklyn College.*
Aid ..... June 1906 to 1908

Boas, Helene Marie.
Laboratory Assistant ..... January 1914 to October 1918

Boynton, Kenneth Rowland.
Supervisor of Gardening Instruction ..... November 1919 to August 1921
Head Gardener ..... September 1921 to May 1934

Brinley, John Rowlett.
Landscape Engineer ..... January 1901 to December 1931

Britton, Elizabeth Gertrude Knight. Died 25 February 1934.
Honorary Curator of Mosses ..... May 1912 to February 1934

Britton, Nathaniel Lord. Died 25 June 1934.
Director-in-Chief ..... July 1896 to July 1929
Director Emeritus ..... August 1929 to June 1934

Camp, Wendell Holmes.
Assistant Curator ..... October 1935 to date

Cannon, William Austin. *Later research associate, Carnegie Institution.*
Laboratory Assistant ..... January 1902 to June 1903

Chandler, Florence Clyde.
Technical Assistant ..... September 1927 to date

Charles, Walter. Died 3 March 1925.
Museum Custodian ..... November 1923 to March 1925

Clute, Willard Nelson. *Later director of the botanical garden, Butler University.*
Curator ..... November 1897 to December 1899

Corbett, Arthur Joseph.
Mechanic in Charge ..... October 1900 to May 1909
Museum Custodian ..... June 1909 to December 1910
Superintendent ..... January 1911 to April 1912
Superintendent of Buildings and Grounds ..... May 1912 to date

Core, Earl Lemley. *Later professor of botany, West Virginia University.*
Research Assistant ..... October 1931 to June 1932

Crawford, James Alfred.
Associate Curator ..... September 1921 to October 1923

Degener, Otto.
Collaborator in Hawaiian Botany ..... June 1935 to date

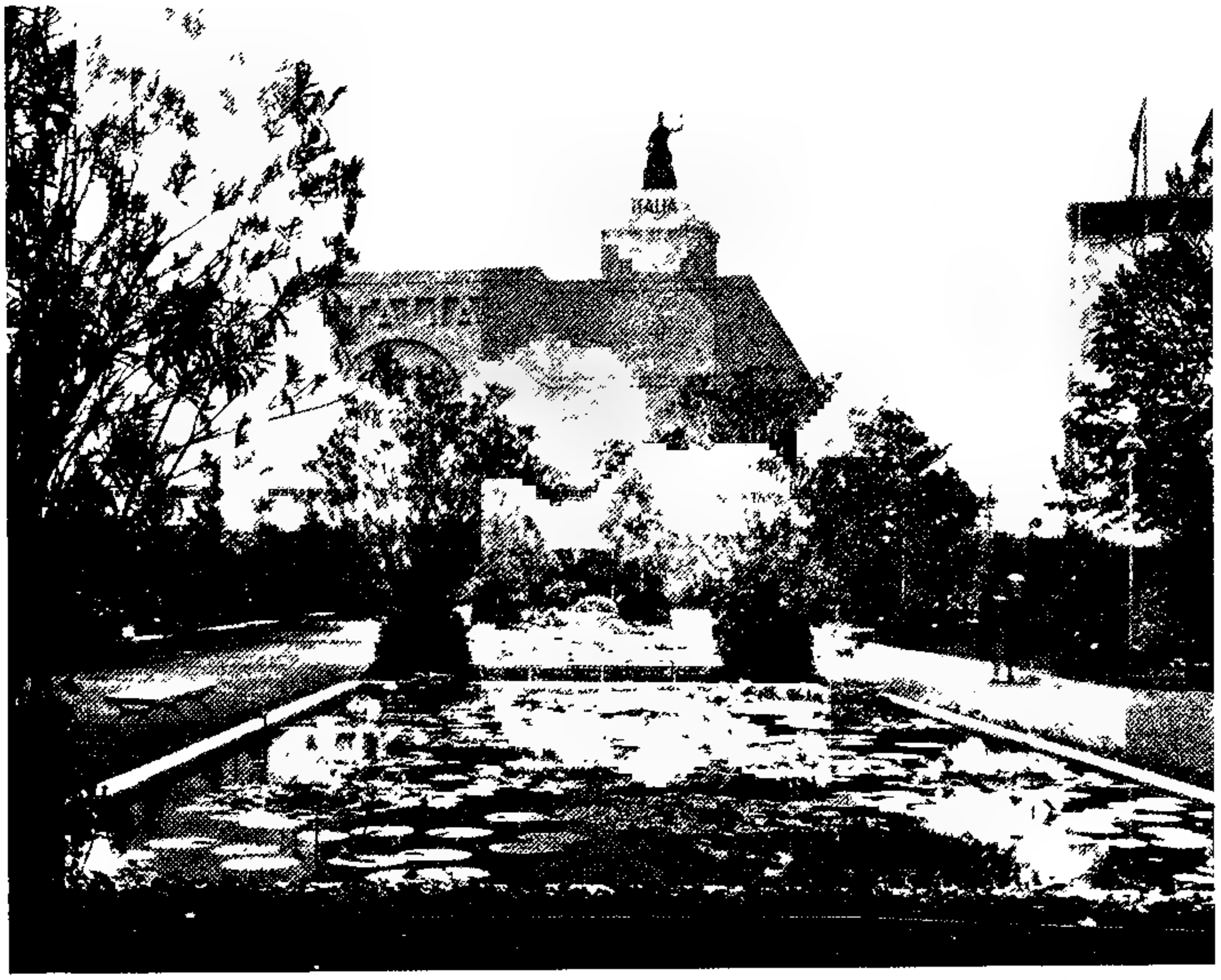
Denslow, Herbert McKenzie.
Honorary Custodian of Local Herbarium ..... January 1922 to April 1932

Dodge, Bernard Ogilvie.
Plant Pathologist ..... May 1928 to date

Earle, Franklin Sumner. *Later director, Estación Central Agronómica de Cuba.* Died 31 January 1929.
Assistant Curator ..... October 1901 to May 1904

Eaton, Mary Emily.
Artist ..... July 1911 to January 1932

Everett, Thomas Henry.
Horticulturist.....August 1932 to April 1934
Horticulturist and Head Gardener.....May 1934 to date
Gager, Charles Stuart. *Later director, Brooklyn Botanic Garden.*
Laboratory Assistant.....September 1904 to January 1905
Director of the Laboratories.....January 1906 to August 1908
Gies, William John.
Consulting Chemist.....January 1902 to December 1921
Gleason, Henry Allan.
First Assistant.....March 1919 to December 1919
Assistant Director.....January 1920 to November 1923
Curator.....December 1923 to May 1932
Head Curator.....June 1932 to date
Deputy Director.....October 1935 to October 1937
Assistant Director.....November 1937 to date
Griffith, Fleda.
Artist and Photographer.....February 1932 to date
Groesbeck, Walter S.
Clerk and Accountant.....January 1899 to April 1937
Hagelstein, Robert.
Honorary Curator of Myxomycetes.....April 1930 to date
Hall, Elizabeth Cornelia.
Librarian.....November 1937 to date
Harlow, Sarah Havens.
Librarian.....January 1913 to October 1937
Librarian Emeritus.....October 1937 to date
Henshaw, Samuel. Died 22 July 1907.
Head Gardener.....January 1897 to December 1900
Hochreutiner, Bénédict Pierre Georges. *Later at Conservatoire Botanique, Geneva, Switzerland.*
European Representative.....December 1905 to 1909
Hollick, Charles Arthur. Died 11 March 1933.
Assistant Curator.....July 1901 to December 1905
Curator.....January 1906 to December 1913
Honorary Curator of Fossil Plants.....January 1914 to June 1921
Paleobotanist.....July 1921 to May 1932
Research Associate in Paleobotany.....June 1932 to March 1933
Howe, Marshall Avery. Died 24 December 1936.
Assistant Curator.....April 1901 to December 1905
Curator.....January 1906 to November 1923
Assistant Director.....December 1923 to September 1935
Director.....October 1935 to December 1936
Kavanagh, Frederick Walker.
Technical Assistant.....February 1938 to date
Kittredge, Elsie May.
Assistant Curator.....December 1917 to July 1919
Knox, Alice Adelaide. *Later principal of private schools.*
Laboratory Assistant.....January 1906 to April 1907
MacDougal, Daniel Trembly. *Later director of the laboratory of plant physiology, Carnegie Institution.*
Director of the Laboratory.....July 1899 to December 1905
First Assistant.....July 1899 to June 1904
Assistant Director.....July 1904 to December 1905
McLean, Forman Taylor.
Supervisor of Public Education.....July 1928 to November 1937
Mariolle, Auguste François Théodore Victor.
Artist.....October 1901 to June 1911
Mathias, Mildred Esther. *Later research associate, University of California.*
Research Associate.....October 1932 to October 1935
Maxon, William Ralph. *Later curator, United States National Herbarium.*
Herbarium Assistant.....September 1898 to June 1899



In Gardens on Parade at the New York World's Fair, three pools filled with waterlilies and other aquatics were maintained by the New York Botanical Garden.

Merrill, Elmer Drew. *Later administrator of the botanical collections, Harvard University.*
Director.....January 1930 to September 1935
Mitchell, Palmyre de Châteaudun Clarke.
Herbarium Assistant.....October 1921 to October 1923
Associate Curator.....November 1923 to February 1933
Moldenke, Harold Norman. ..
Assistant Curator.....September 1933 to June 1937
Associate Curator.....July 1937 to date
Montagne, Henry de la.
Business Manager.....June 1932 to date
Assistant Director.....July 1935 to date
Murrill, William Alphonso.
Assistant Curator.....September 1904 to December 1905
First Assistant.....January 1906 to October 1907
Assistant Director.....November 1907 to December 1918
Curator of Public Instruction.....January 1919 to July 1924
Nash, George Valentine. Died 15 July 1921.
Assistant to Director.....April 1896 to December 1899
Curator of the Plantations.....January 1900 to December 1900
Head Gardener.....January 1901 to December 1919
Head Curator and Curator of the Plantations.....January 1920 to July 1921
Parsons, Henry Griscom.
Supervisor of Gardening Instruction.....March 1917 to October 1919

Peckham, Ethel Anson Steel.
Honorary Curator, Iris and Narcissus Collections.....June 1927 to date
Pennell, Francis Whittier. *Later curator, Academy of Natural Sciences of Philadelphia.*
Associate Curator.....October 1914 to August 1921
Pfander, August Charles.
Assistant Superintendent.....May 1934 to date
Rickett, Harold William.
Assistant Bibliographer.....July 1939 to date
Robbins, William Jacob.
Director.....October 1937 to date
Robinson, Charles Budd. Died 5 December 1913.
Museum Aid.....June 1904 to October 1905
Assistant Curator.....January 1906 to December 1907
Assistant Curator.....January 1912 to September 1912
Robinson, Winifred Josephine. *Later dean of women's college, University of Delaware.*
Laboratory Assistant.....July 1907 to September 1908
Rusby, Henry Hurd.
Honorary Curator of the Economic Collections.....January 1898 to date
Rusk, Hester Mary. *Later instructor, Brooklyn Botanic Garden.*
Technical Assistant.....July 1920 to August 1926
Rydberg, Per Axel. Died 25 July 1931.
Assistant Curator.....June 1899 to December 1905
Curator.....January 1906 to July 1931
Schilling, Francis Alexander. Died 4 November 1923.
Superintendent of Buildings and Grounds.....January 1900 to December 1910
Museum Custodian.....January 1911 to November 1923
Schneider, Richard Conrad.
Museum Aid.....July 1903 to June 1905
Garden Aid.....1907 to December 1908
Custodian of the Plantations.....January 1909 to December 1909
Seaver, Fred Jay.
Director of the Laboratories.....September 1908 to September 1911
Curator.....October 1911 to date
Shafer, John Adolph. Died 1 February 1918.
Museum Custodian.....November 1903 to May 1909
Shreve, Forrest. *Later in charge of Desert Laboratory (Tucson), Carnegie Institution.*
Honorary Assistant (Cinchona Station).....July 1905 to June 1906
Slosson, Margaret.
Museum Aid.....1911 to 1914
Assistant Curator.....1914 to November 1917
Small, John Kunkel. Died 20 January 1938.
Curator.....January 1898 to December 1905
Head Curator.....January 1906 to May 1932
Chief Research Associate and Curator.....June 1932 to January 1938
Smith, Albert Charles.
Assistant Curator.....July 1928 to June 1932
Associate Curator.....July 1932 to date
Southwick, Edmund Bronk. Died 18 December 1938.
Custodian of the Herbaceous Grounds.....January 1924 to May 1934
Stout, Arlow Burdette.
Director of the Laboratories.....October 1911 to December 1937
Curator of Education and Laboratories.....January 1938 to date
Susa, Torasaburô. *Later director of Aomori Horticultural Experiment Station (Kuroishi).*
Technical Assistant.....September 1926 to August 1927
Swift, Marjorie Elizabeth. *Later at Rockefeller Institute for Medical Research (Princeton).*
Assistant Pathologist.....May 1929 to August 1932

In the City Building at the New York World's Fair there was an activated, life-size model of the krubi, largest "flower" in the world, which bloomed for the first time in the Western Hemisphere at the New York Botanical Garden.

Taylor, Norman. *Later curator of plants, Brooklyn Botanic Garden.*
Museum Aid.....March 1904 to January 1908
Custodian of the Plantations.....February 1908 to December 1908
Assistant Curator.....January 1909 to May 1911

Teuscher, Henry. *Later director of technical services, Montreal Botanical Garden.*
Dendrologist.....March 1933 to April 1936

Tyler, Ansel Augustus. *Later professor of biology, James Millikin University.* Died 31 March 1922.
Curator.....February 1897 to May 1897

Vail, Anna Murray.
Librarian.....January 1900 to September 1907

Van Brunt, Cornelius. Died 1 October 1903.
Honorary Floral Photographer.....April 1900 to October 1903

Weikert, Rosalie.
Museum Aid.....January 1913 to December 1929
Technical Assistant.....January 1930 to date

Wille, Johan Nordal Fischer. Died 4 February 1924.
Research Associate.....November 1914 to April 1915

Williams, Robert Statham.
Museum Aid.....December 1899 to December 1905
Assistant Curator.....January 1906 to June 1910
Administrative Assistant.....July 1910 to May 1932
Research Associate in Bryology.....June 1932 to date

Wilson, Percy.
Museum Aid.....January 1899 to July 1903
Administrative Assistant.....August 1903 to June 1904
Administrative Assistant.....December 1904 to June 1910
Docent.....July 1910 to January 1912
Assistant Curator.....January 1911 to January 1913
Associate Curator.....February 1914 to December 1938
Research Associate.....January 1939 to date
Wittrock, Gustave Ludwig.
Docent.....February 1930 to date
Woodward, Carol Helen.
Editorial Assistant.....February 1931 to date

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*H. R. Kunhardt

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W. V. Lawrence
*Meyer H. Lehman

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Gustavus A Pfeiffer
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S. D. Webb
W. Seward Webb
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John D. Wing
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*Charles T. Yerkes

*Jeremiah L. Zabriskie

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Mrs. Lawrence P. Bayne
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Mrs. Harold Brown
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Charles T. Church
E. Mabel Clark
Mrs. Robert J. Collier
Paul D. Cravath
Mrs. Suydam Cutting
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Gertrude Dodd
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Carll Tucker
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Miriam Dwight Walker
Mrs. Hamilton Fish Webster
Alain White
Mrs. William H. Woodin

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Fairfield Garden Club
Laurel Garden Club
Mamaroneck Garden Club
Matinecock Garden Club
Morristown Garden Club
Mt. Vernon Garden Club
New Rochelle Garden Club
North Country Garden Club
Plainfield Garden Club
Ridgefield Garden Club
Riverdale-on-Hudson Garden Club
South Orange Garden Club

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Sherman Baldwin
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Walter Beinecke
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William B. Bell
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Bruno Benziger
Mrs. Charles F. Berger
J. G. Berman

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Mrs. Henry J. Bernheim
Mrs. Isaac J. Bernheim
Philip Berolzheimer
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Stephen Biggs
Mrs. Wm. Richardson Biggs
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Cecil Billington
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Katherine H. Birchall
Mrs. Dexter Blagden
Mrs. Emmons Blaine
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Mrs. Walter P. Bliss
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Lewis M. Bloomingdale
Hugo Blumenthal
Sydney Blumenthal
Edwin Blun
Bradford Boardman
Miss R. C. Boardman
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Theodore Boettger
Marston T. Bogert
Rose Bondy
Frederick T. Bonham
Mrs. Frederick T. Bonham
Mrs. J. R. Herbert Bonne
Mrs. L. W. Bonney
Mrs. Sidney C. Borg
L. W. Bowden
George T. Bowdoin
Spotswood D. Bowers
Eugene Brady
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George P. Brett
Joseph Brettaner
Mrs. Jules Breuchaud
Frederick F. Brewster
Hans V. Briesen
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H. Louis Britton
Richard H. Britton

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Ronald K. Brown
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Vernon C. Brown
Louisa Bruchman
P. F. Brundage
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Mrs. Susanna Bixby Bryant
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Emily Buch
Mortimer N. Buckner
David Todd Bulkley
Mrs. Jonathan Bulkley
Russell E. Burke
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Floyd L. Carlisle
Mrs. Lister Carlisle
Sidney Carpender
Mrs. Ernest T. Carter
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Frank Chlumsky
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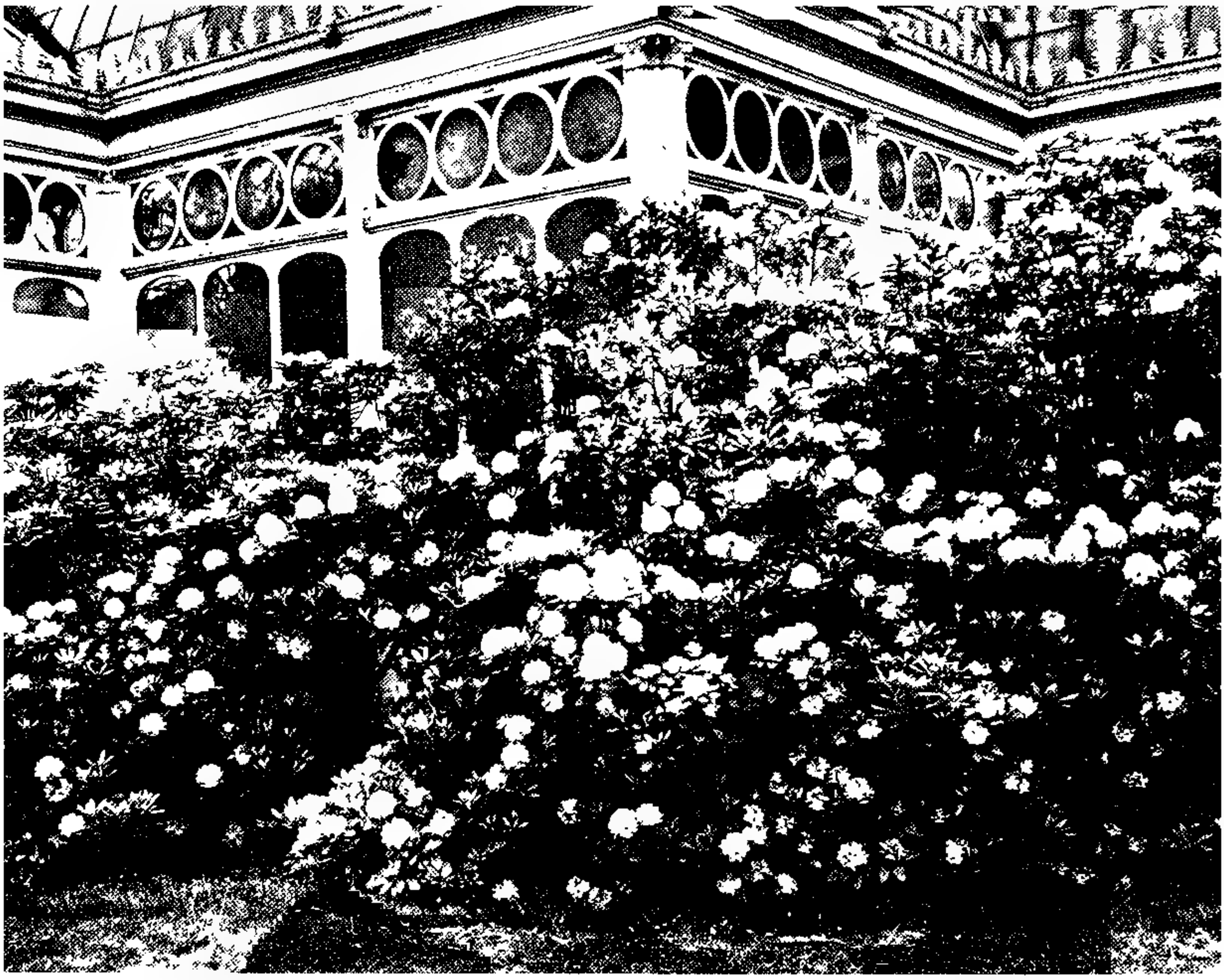
Mabel Choate
Mrs. F. Y. Chubb
City Gardens Club
*John Claflin
F. Ambrose Clark
Mrs. George Halford Clark
Mrs. J. William Clark
William Clark

* — Deceased.



Rhododendrons in bloom outside of the Main Conservatories.

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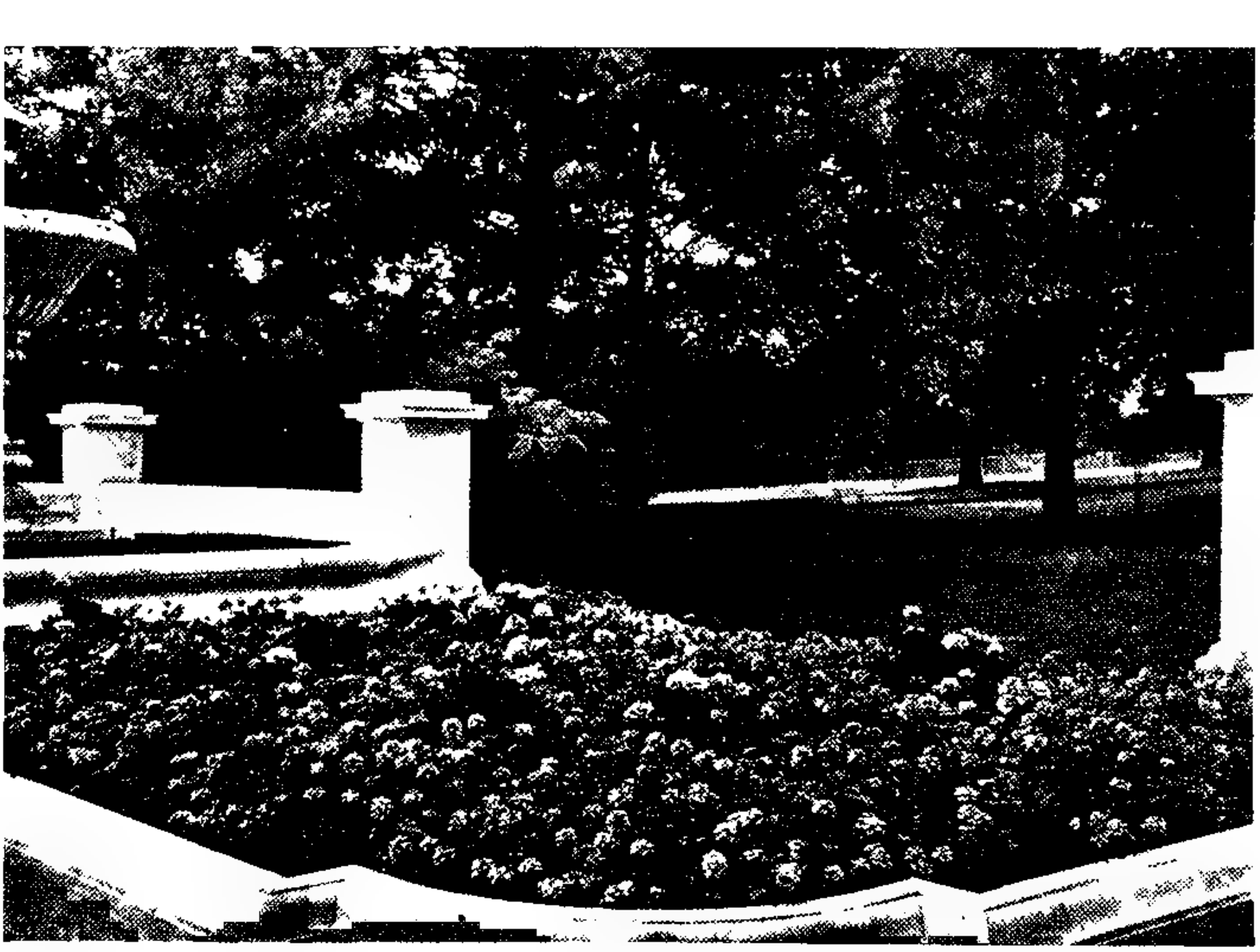

Verbenas and geraniums around the lower fountain in front of the Museum Building.

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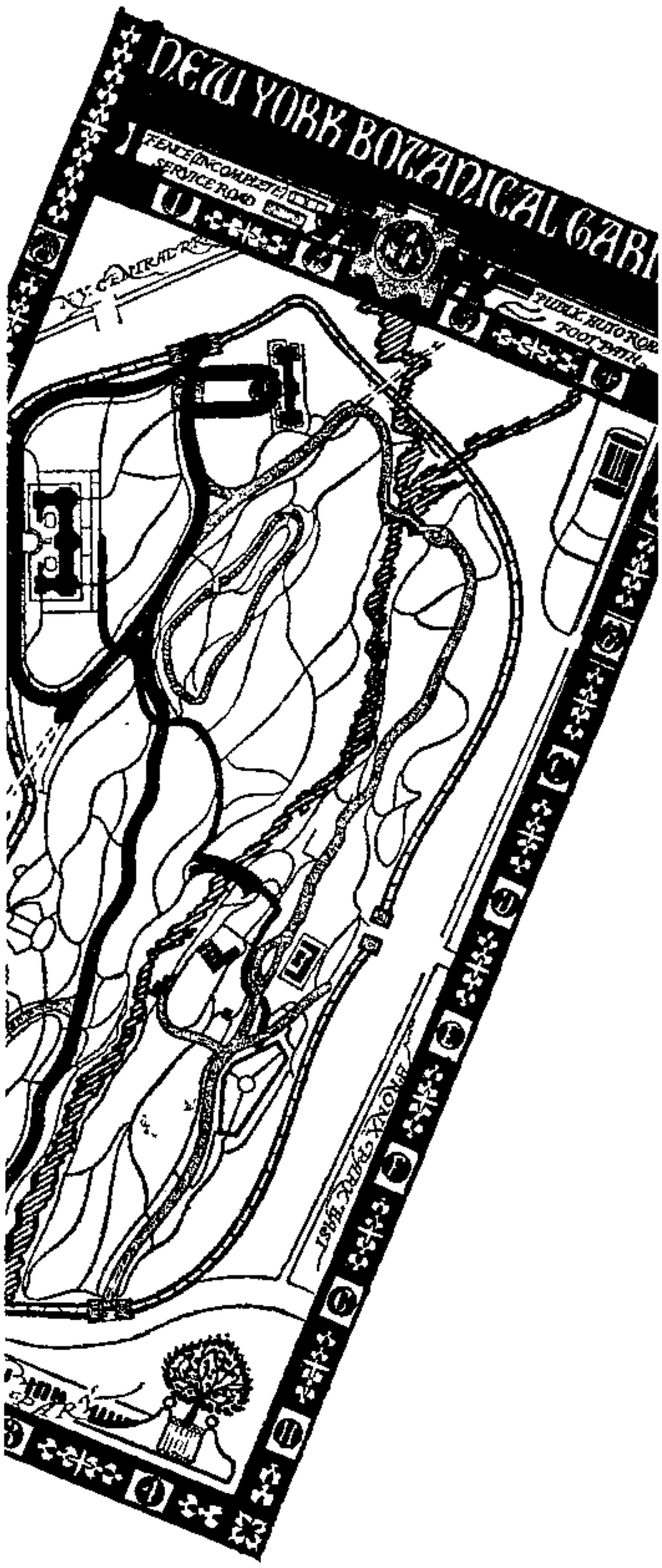

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NEW YORK BOTANICAL GARDEN
1891

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OF
THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD
EDITOR

VOLUME 42

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NO. 493 1941 1—24

JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor
January 1941

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THE AMATEUR IN BOTANY

Two recent programs at the New York Botanical Garden have brought out the importance of the work of the amateur botanist or, as one speaker expressed it, the "expert-amateur." Were it not for the work of two such men—Robert Hagelstein and Joseph F. Burke, both now on the staff as honorary curators—the Garden's collections of myxomycetes and diatoms would be nowhere near their present rank among the world's largest and most complete.

The nucleus of the Garden's collection of fungi is the herbarium of J. B. Ellis, who was known in his day as the greatest mycologist in America, yet who worked entirely as an amateur.

Many thousands of finely mounted specimens of flowering plants from the vicinity of New York were collected during the early part of the century and presented to the New York Botanical Garden by E. P. Bicknell, an amateur botanist who during business hours was a banker in New York. The K. K. Mackenzie herbarium of 43,000 sedges, which has formed the basis of the important Mackenzie monograph on the Cariceae published last year by the Garden, was the work of an amateur, carried on mostly during holidays in the life of a corporation lawyer.

Out in Missouri a small-town postmaster, Benjamin F Bush, who died just a few years ago, was one of the first to investigate the flora of the Ozarks, and the Botanical Garden now contains, among several thousand of his specimens, many plants which represent new discoveries of species in that region. His work was of the utmost importance in the studies later made by professional botanists.

A little earlier, in Illinois, there lived a farmer, Elihu Hall, who was an equally enthusiastic and influential botanist. His name may also be found on many specimens now in the Garden's herbarium.

When botanists from any section of the world, including South America, wish to study the plants of Bolivia and Peru, they find at the New York Botanical Garden the world's largest assemblage of material from these two countries. Aiding the work of the professionals in collecting it have been a number of amateurs, among them Miguel Bang, Otto Buchtien, a physician; Guillermo Klug, a mining engineer; Martin Cardenas, an educator, and, the greatest of all, H. H. Rusby, who professionally was a pharmacist

Of the 65,000 specimens in the local herbarium at the Garden, it is estimated that more than 60 percent have been contributed by amateurs. Of the more than 2,000 000 specimens in the entire herbarium, possibly 20 percent, or about 400,000, have been gathered by non-professional botanists.

Fortunate is the man who has found a hobby which not only occupies his interest but contributes to the knowledge of mankind. Many amateurs have played important roles in the development of the science of botany, Charles Darwin and Gregor Mendel among them; and many, it has been seen, have helped to build up the New York Botanical Garden. Elizabeth Gertrude Britton herself was an amateur. There is room today for still more men and women whose enthusiasm for plants will help to increase the world's understanding of botany.

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Habits And Life History Of The Diatoms

By Lois C. Lillick

DIATOMS—minute, one-celled, brownish-green plants—comprise a major sub-group of that large and relatively simple division of the plant kingdom, the algae. They are an important group from the standpoint both of abundance and of economic value. In size they range from cells barely visible under the best of microscopical aid (that is, about 4 microns long, or 4/25,000 of an inch), to forms visible to the naked eye (from several hundred to 2,000 microns long).

The diatom, whose internal structure is little different from that of a single cell of a higher plant except in the nature of its pigments and food storage products, is encased in a hard, transparent, box-like shell, the presence of which distinguishes diatoms from all other plants. This case consists of two fitted halves which give the whole a structure like an old-fashioned pillbox. It is made up of silica, which is extracted by the cell from the surrounding water. On this glassy shell are markings which may take many forms, but are always in a characteristic pattern for one species. Each type of marking has a technical name, but let it suffice here to mention only that the large, deeply cut, generally median line is called the *raphe*. The presence or absence of this line is a major diagnostic character for certain large groups, and the raphe is capable of assuming many forms in as many species. Of the other markings some seem to be merely lightly scratched on the surface, but others are deeply etched lines or pits which may actually penetrate the shell. This is true in diatoms which show motility, and it is believed that the movement is brought about by the flow of cytoplasm out through openings along the outer surface of the shell and into others, this flow propelling the cell forward. In many, particularly among marine species, protuberances may arise from the surface of the shell in the form of knobs, spines, hooks or long hairs. In fresh-water forms the shell markings are more pronounced, but in either group the etched and irregular surfaces present countless beautifully perfect geometric designs. Often these are obscured by the internal

pigments[1] of the cell, and for this reason diatoms are frequently treated to destroy the organic matter before being examined.

Because of its pillbox form one-half of the diatom shell, or one valve, is bigger than the other, the larger half fitting over the smaller, and this overlapping area is known as the "girdle". Thus, when a diatom is viewed with this side uppermost, it is said to be in girdle view; when the full face of the valve is uppermost, it is said to be in valve view, there being two possible valve views which may be alike or not, and an indefinite number of girdle views, depending on the shape of the cell. In the scientific literature diatoms are described from these two views.

How They Increase in Number

During cell division the two valves push apart at the girdle, and the cytoplasm divides so that some goes with each half. A new siliceous valve is then formed for each half, the new valves always being the smaller, their edges forming the inside of the new girdle. Thus the two daughter cells are completed, one being the same size as the parent, the other somewhat smaller.

The diatom has little or no capacity to stretch the hard valve; therefore in time, though there always remain some cells of the same size as the original parent, the mean cell dimension of the population mass gradually decreases. Potentially this could continue until the diatoms were too small to divide further, and at times this undoubtedly happens. Certainly every observer has seen cells of all sizes belonging to one species. However, usually along the line somewhere, the protoplasm of a small cell, instead of dividing further, rounds up, loses part of its fluid, forms a wall of its own and escapes from the old cell wall as a spore. Further "rejuvenation" processes take place within the spore, and eventually the protoplast escapes to form around itself a new shell of the maximum dimensions. In this way the size of a species is maintained.

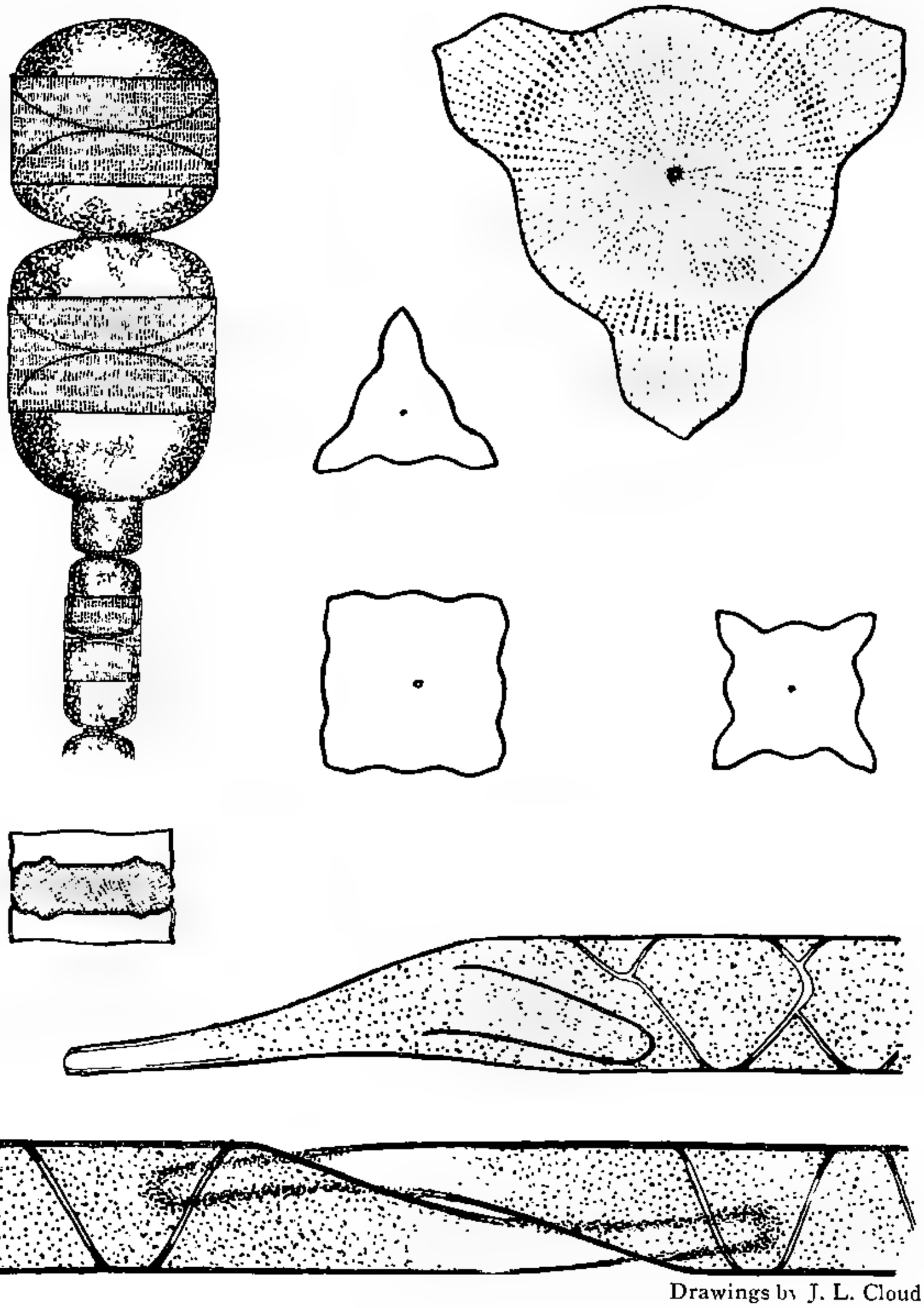
Among the marine diatoms the siliceous wall is neither as firm nor as thick as in the fresh-water species, and it is capable of some stretching, with the result that there is much less variation of size among these. Another type of spore, the "resting spore", can also develop in many cases, a resistant type whose function apparently is to carry the species through adverse environmental conditions.

Characters of the Group

Because cell shape and arrangement and the valve markings have been found to be characteristic features of the diatoms, the classification of this large group of plants has been constructed upon these qualities. At various times scientists in distant parts of the world have given this assemblage several different scientific names: Bacillariales, Bacillariae, Bacillario-

[1]Diatoms contain chlorophyll which serves them the same as any other green plant, and in addition they have certain orange and yellow pigments which give them a characteristic brown appearance.

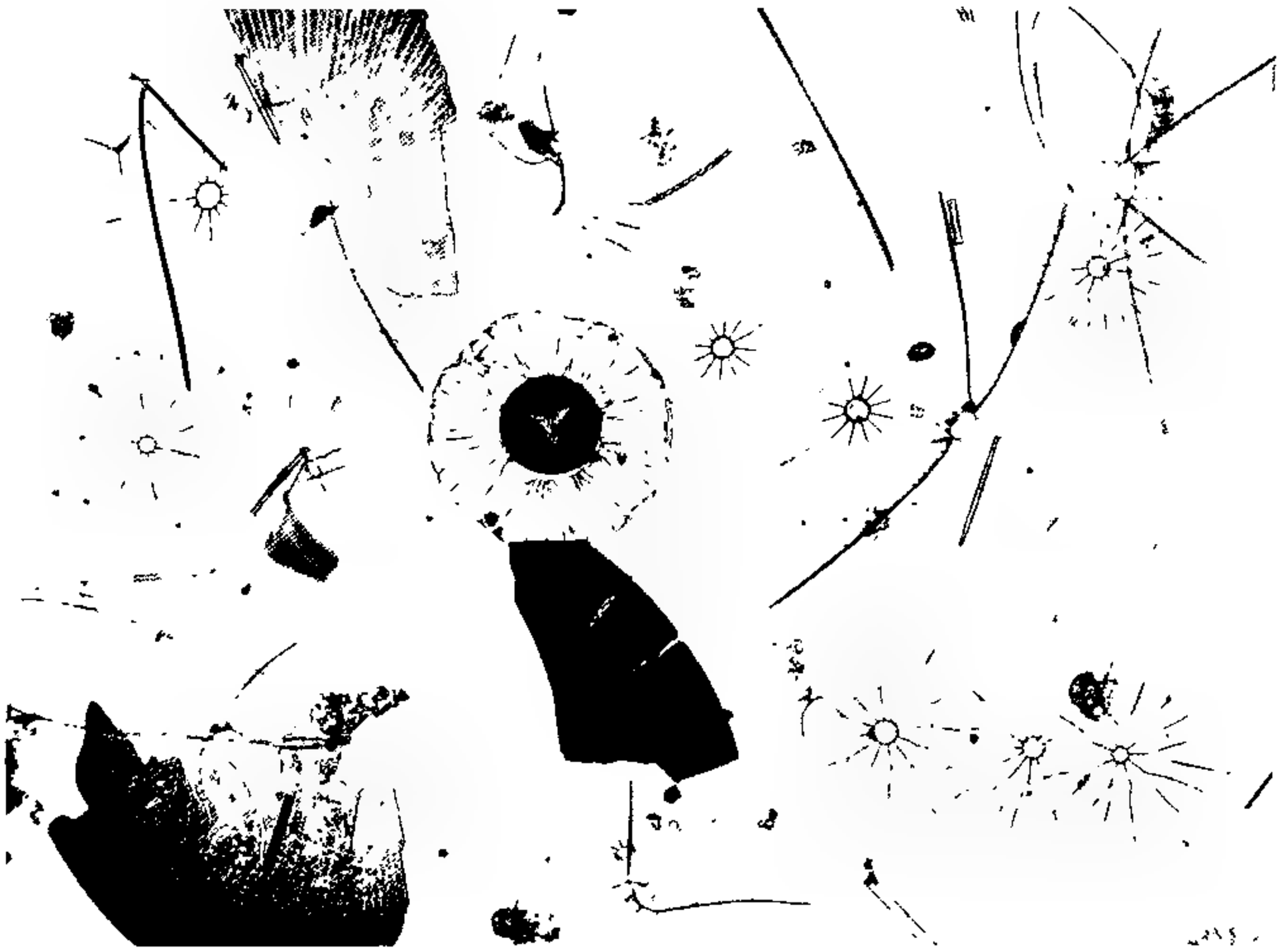
phyceae, Diatomeae and others. There is still no unity of opinion. Basically the diatoms seem to fall into two main groups which are easily distinguishable. In one of them there is a definite median line to which the cell shape and wall markings contribute a bilateral symmetry, this order being called the *Pennales* or *Pennatae*. To the second order,



Drawings by J. L. Cloud

SOME COMMON MARINE DIATOMS OF LONG ISLAND

Upper left: Cell-division after auxospore-formation in Melosira moniliformis.
Upper right: Lithodesmium undulatum with variant forms.
Below: Rhizosolenia alata, showing the bordered depression in which the valve of the adjoining frustule, or cell, rested, and (at the bottom) the ends of two frustules, after cell-division.



Photomicrograph by Philip O. Gravelle

Plankton diatoms from the sea of Java Every object shown here is a marine diatom or a broken piece of one, magnified 194 diameters.

Centrales, are assigned species which show radial symmetry or irregular variations of this. The majority of fresh-water diatoms fall under the first order, the marine species under the second. Under each order are many classes, families and thousands of genera and species.

Where Diatoms Live, and How

Diatoms are ubiquitous, but occur almost if not entirely in moist environs; practically any collection of water samples will include some of these organisms. They occur regularly in the plankton (free floating life), of which they are the main plant constituent both in fresh and salt waters. Because one of their metabolic products is oil and because they secrete a mucous material, they are usually slimy, and commonly grow in mucilaginous masses over any available substrate, a fact of which many people have become forcibly aware while attempting to walk on the stones of a creek. Frequently great masses of them become detached and float freely. Many species have stalks whereby they are attached in slippery coatings to rocks, mud, plants, animals, debris or almost any conceivable host.

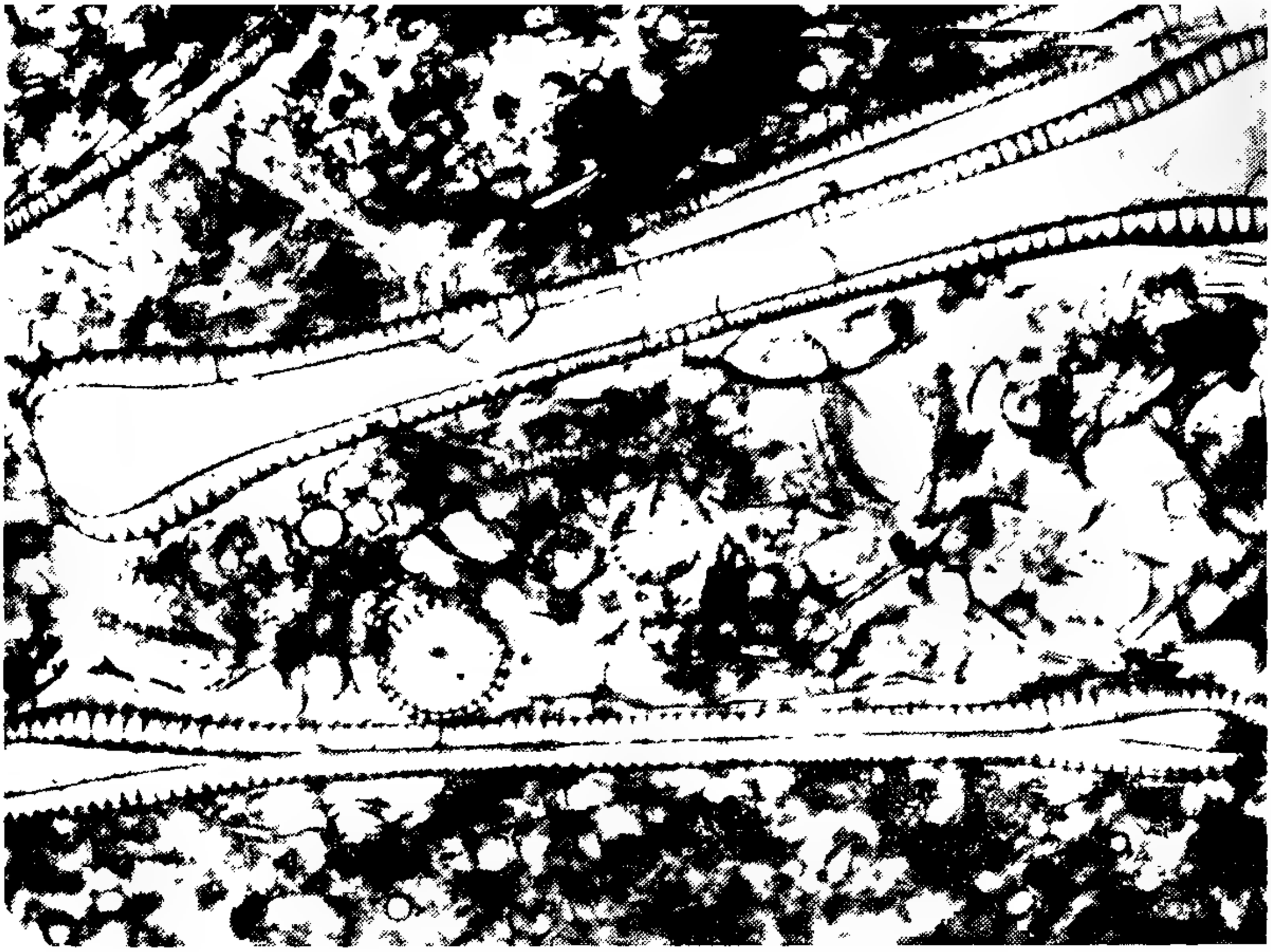
The great majority of diatoms exist as isolated cells, their relationship to each other being casual when two or more of them are found together.

However, there are large groups of colonial diatoms in which the cells regularly and constantly occur in associations of two or more. The most common arrangement is that of a chain, formed merely by the attachment of the hook-like protuberance of one cell to the hook of another, or by the entwining of the long hairs of one cell about those of another. These couplings together are not a matter of chance, for within one species the method of arrangement is invariably the same. In other cases cells may be strung along like beads with a protoplasmic chain between each two; in still other instances actual filaments appear to be formed. Disk-like species may stack themselves like poker chips. Rod-like forms may arrange themselves in the form of wheel spokes, or may lie parallel to each other in bundles of one or two planes. The various types of arrangement are too numerous to mention, but perhaps the most interesting is that of *Bacillaria paradoxa*,[2] a marine species in which a number of plank-like cells are basically laid side by side in the form of a raft, but the cells are

Photomicrograph by Philip O. Gravelle

A diatom in cementstein, magnified 500 diameters. Coscinodiscus is shown here in two views, one parallel and one perpendicular to the valvar plane. x 500.

[2]The name *Bacillaria* bears no relation to the name *Bacillus*, which is a totally different type of organism.



Photomicrograph by Philip O. Gravel

A thin section of cementstein, which is a hard diatomaceous earth from the island of Mors, Jutland, Denmark. x 500.

in constant motion, sliding back and forth upon each other. Each cell slides the full length of the cell above it, and when the whole group is extended as far as possible, resembling a low staircase with broad steps, the cells slip slowly back again in the opposite direction. (See page 8.)

There are numerous interesting problems connected with the world-wide distribution of diatoms. Many species, presumably old ones, are common to all parts of the world; others are limited to one continent or one climatic region, or may be even more narrowly restricted. More is known concerning the ecology of marine species than of fresh-water ones, the flora of definite water masses being found to present the same cycle of species year after year. Contrary to all expectations the diatoms thrive best in cold water, the most luxuriant growth being found in arctic and sub-arctic regions, and in temperate regions during the colder parts of the year. Progressively toward the equator the mass of production decreases, until in tropic waters it is relatively scant. In large bodies of water — the sea, lakes, and rivers of arctic, boreal, and cold temperate regions planktonic diatoms pass through a rigid yearly cycle. The peak of production accompanied by the greatest variety of species comes in the spring when the waters are at their coldest, at which time there is a sudden outburst of intensive growth lasting for a few weeks only. For the rest of the spring and summer diatoms are very scarce, but

in early fall there is a second peak of production, usually less intense and of shorter duration than that of the spring. This second rise is immediately followed by a poverty of plant life which persists until the following spring. Toward the equator there is a tendency toward more and more even but relatively poorer production at all times of the year.

Sexual Reproduction

The morphology of diatoms has already been discussed in brief. Although the ordinary means of multiplication is by cell division, in recent years it has been established beyond doubt that sexual reproduction also takes place in a fairly large number of diatom species. All authenticated cases of this have been members of the *Pennales*. Two cells, which are to all appearances alike, come to lie parallel to one another; within each cell nuclear divisions take place, the exact mechanism of which is not yet entirely understood. The next step in the process varies according to species; in some cases all or part of the protoplasm of one cell slips out between its two valves and migrates into the other cell, where fusion takes place. In other cases the protoplasmic contents of both members leave

A portion of the same diatom is shown here as appears in the upper right-hand corner on the opposite page. The pill-box formation is clearly shown in the region of the girdle. x 2060

Photomicrograph by Philip O. Gravelle

The "low staircase with broad steps" formed by Bacillaria paradoxa (also known as Nitzschia paxilliſer), as described on page 6. Photographs of this colony taken at one-minute intervals show the shifting of the raft-like diatoms, one upon another. Magnified 184 diameters.

Photomicrograph by Philip O. Gravelle

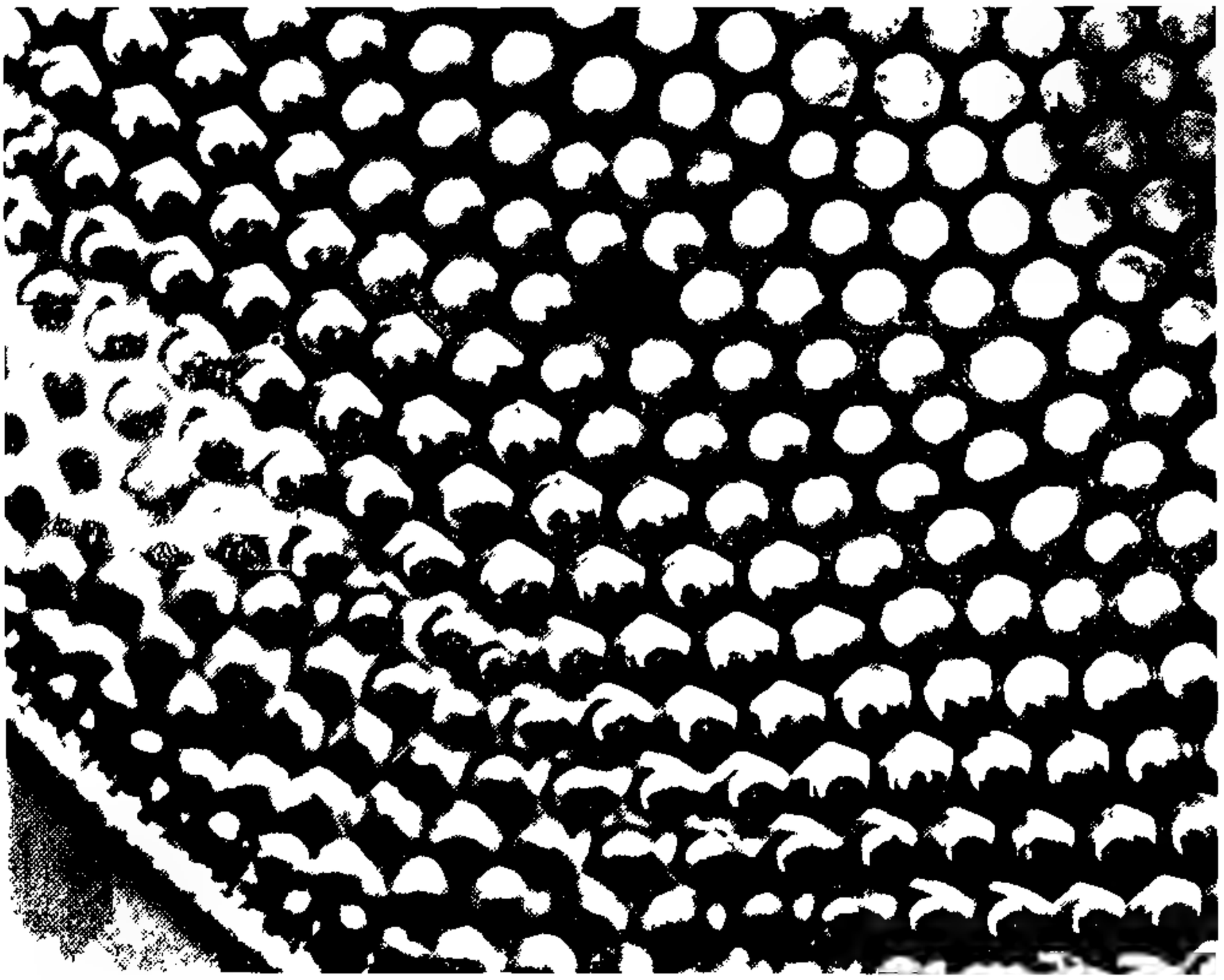
their respective shells and unite in a ball between the two. Variations of both types occur. Further changes take place in the cytoplasm of the zygote (fusion cell), and eventually a new cell similar to the parents emerges, which may go immediately into a state of cell division.

Among the *Centrales* there have been a few scattered reports of a type of sexual reproduction, in which the contents of one cell break up into a number of tiny motile cells or "sperms", which escape to swarm around another cell whose protoplasm has not divided up. Theoretically one of the small cells penetrates the large one, and from the resulting fusion a spore arises whose further course of development outside the parent body leads to the emergence of a diatom in all respects similar to the original parent. This whole process has not been established beyond question, and certainly the problem needs much further study. Strictly speaking, this sexual process is a means of cell rejuvenation rather than of multiplication.

The Age of Diatoms

In the scale of geologic time the diatoms date back to the cretaceous period. The hard siliceous shell is readily preserved, and in various parts of the world, notably our own West, there are thick deposits of these shells commonly known as diatomaceous earth, a chalk-like soft rock consisting of tightly packed diatoms. In places these deposits are several hundred feet thick, and must have taken millions of years to accumulate, at a time when that part of the earth's surface was under water. On certain parts of the ocean floor where conditions are right for the preservation of dead plankton algae, there are thick oily layers of "diatom ooze", a noteworthy example of this being discovered by the recent scientific expeditions into the Antarctic, in regions where the cold water layers, rich in plankton, meet the warmer currents, causing the diatoms to drop rapidly to the bottom. Other fossil or preserved diatom deposits are found in rock layers, in bog lakes, and in certain fresh-water bodies.

The diatoms have in the course of their history developed through most of the evolutionary stages common to the major groups of algae, as we now understand these, from the single cell to the simple filament, but beyond that, evolutionarily speaking, they are a dead end, for they have never led to any type of higher plant of which there is a record,



Photomicrograph by Philip O. Gravelle

Coscinodiscus magnified 2060 diameters to show the structure of the walls of the areolae, or markings on the surface of the shell

modern or fossil. In years to come new fossil discoveries may change these ideas.

It is difficult to estimate the commercial value of any group of organisms, but certainly the diatoms rank high in importance among the algae. The shells serve as a mild abrasive, and diatomaceous earth has long been used as the major constituent of silver polishes. It is interesting to pick out the shells from some of these under a microscope. The "earth" has also been used in certain adsorbent cleansers, and it was formerly used in the manufacture of dynamite. Among its principal uses today are as a filter-aid, for insulation and other building purposes, and in the sugar-refining industry.

In the economy of water bodies, diatoms, as well as some other groups of algae, rank as the basic link of the food chain, serving as food for the small plankton animals, which are in turn eaten by the larger ones, and so on up the line; but many kinds of fish feed directly upon the diatoms, and, oddly enough, so do certain whales and seals.

Collecting Diatoms

For those who are interested, the collection of diatoms is very simple; all that is necessary is to dry the materials containing them in mica or paper, or to put them into 2 to 10 percent formalin, in which they will keep for an indefinite period but eventually break down. Most collectors prefer to keep permanent slides of specimens. It is then necessary or at least wise to clean them and mount them in a suitable medium. There are many elaborate methods of cleaning diatoms, but the simplest is to place a few drops of the material on a small cover glass and heat this with a hot flame for a half hour, at the end of which time all the organic matter will have been destroyed, leaving only the clear shells. These can then be mounted in a drop of mounting fluid, hyrax being one of the best because it gives the best refractive index for viewing diatom markings under the microscope. While these methods, unfortunately, have not proved satisfactory for the majority of marine diatoms, at the present time there are in the country a number of collections of slides prepared in some such fashion, which are over 50 years old, and which are as good now as the day they were made. It is on collections such as these that much of the critical scientific taxonomic work of the future will depend.

Introductions Of Daylilies In 1941

By A. B. Stout

TWENTY CLONES of daylilies which have been developed at the New York Botanical Garden are here given horticultural names and described in print for the first time.

All of these are seedlings of hybrid origin and many have a complex ancestry that includes several species and also several generations of selective breeding after the hybridization. In the descriptions of the coloring, references are made to "Color Standards and Color Nomenclature" by Ridgeway, to the first volume of the "Horticultural Color Chart" recently published by the Royal Horticultural Society, and to the plate of colors in the "Garden Dictionary" edited by Norman Taylor and published by Houghton Mifflin and Co. Some reference is here made to color patterns; it is planned to present in a later issue of the Journal a survey of the principal classes of color patterns in flowers of daylilies.

It has already been reported to the readers of this Journal (February 1931, page 32) that the New York Botanical Garden does not propagate the daylilies either for sale or general distribution. This is done by the Farr Nursery Co. All of the clones here described have been under observation and critical evaluation during several years of propagation in the nursery of this company, whose records on evaluations, on vigor and

hardiness, and on other important characteristics of these selections have been considered in deciding on introductions and in formulating the descriptions here presented.

In connection with the research on the genus *Hemerocallis* at the New York Botanical Garden, which began in 1912, a total of about 70,000 pedigreed seedlings have been grown. Some 500 of these have been selected for future breeding and for critical evaluation in respect to their value for cultivation in gardens. Beginning in 1930 and previous to the present publication, 28 different new horticultural clones and one species (*Hemerocallis multiflora*) have been distributed to the trade. The present list of introductions adds several rather distinctly new types. In at least one rather important horticultural feature, each of these clones is different from any other introduction.

In the daylilies, selective breeding following hybridization has been especially effective in developing distinctly new clones in which certain characters are much modified or even new in expression.

As a rule, in *Hemerocallis* in the first generation hybrids of species crosses there is some degree of dominance and recessiveness or there is an intermediate expression for each pair of the contrasted characters of the parents. But differences in the behavior of several different contrasted characters are responsible for hybrids that are quite distinct from either of the parents. This condition becomes more complex when there are multiple-hybrid differences and especially when three or more species are involved in an ancestry.

But in these daylilies there are numerous cases of rather distinctly new expressions or modifications of character, and of these several classes are to be recognized:—

1. The modification may be an expression that is intermediate for the contrasted characters of the two parents. When this involves the interaction of a particular pair of hereditary units (alleles) in heterozygous condition the next generation shows simple segregations and the new character "does not breed true."

2. Many cases of differences are due to developmental interferences in expression. For example, the "twisted petal" character appears somewhat different with a narrow petal than with a broad petal.

3. In more complicated cases the hereditary factors carried by two or more non-homologous chromosomes are involved in complementary and modifying reactions. Selective breeding after hybridization is especially effective in such cases. It provides for increased complexity in the complement of chromosomes; it develops greater homozygocity when this increases the intensity of expression; it accumulates hereditary genes that have mutated; and it continues new associations of genes that may result from cross-overs or other rearrangements within chromosomes.

An example of this is the intensification of red pigments which gave the first plants with flowers that are dark mahogany-red. First there were hybridizations which involved yellow-flowered species and species that had fulvous flowers. The F_1 generation had pale fulvous flowers and none of the F_2 that were obtained had flowers that were darker than the more fulvous plant. Then plants that showed the greatest degrees of anthocyanin pigmentation were used as parents in further breeding and back-crossing. In the fifth generation seedlings were obtained whose flowers had degrees of dark red pigmentation not seen hitherto in any daylily. The various complementary factors which interact in these daylilies to intensify anthocyanin

1.

EI[illegible]BEING INTRODUCED S

BEING INTRODUCED

THIS YEAR

1. *Sachem, of a deep red approaching garnet-brown*

2. *Dominion, rich red in three contrasting tones.*

3. *Buckeye, a June-blooming bicolored type.*

4. *Port, an outstanding small red flower with greenish-orange throat.*

5. *Brunette, the first chocolate-colored daylily named at the Garden.*

6. *Mignon, the smallest of all, with pale yellow flowers.*

7. *Monarch, a distinctive flower of lemon yellow with sepals and petals contrasting in their shape.*

8. *Triumph, another of individual form, with rich orange coloring.*

2.

3.

4.

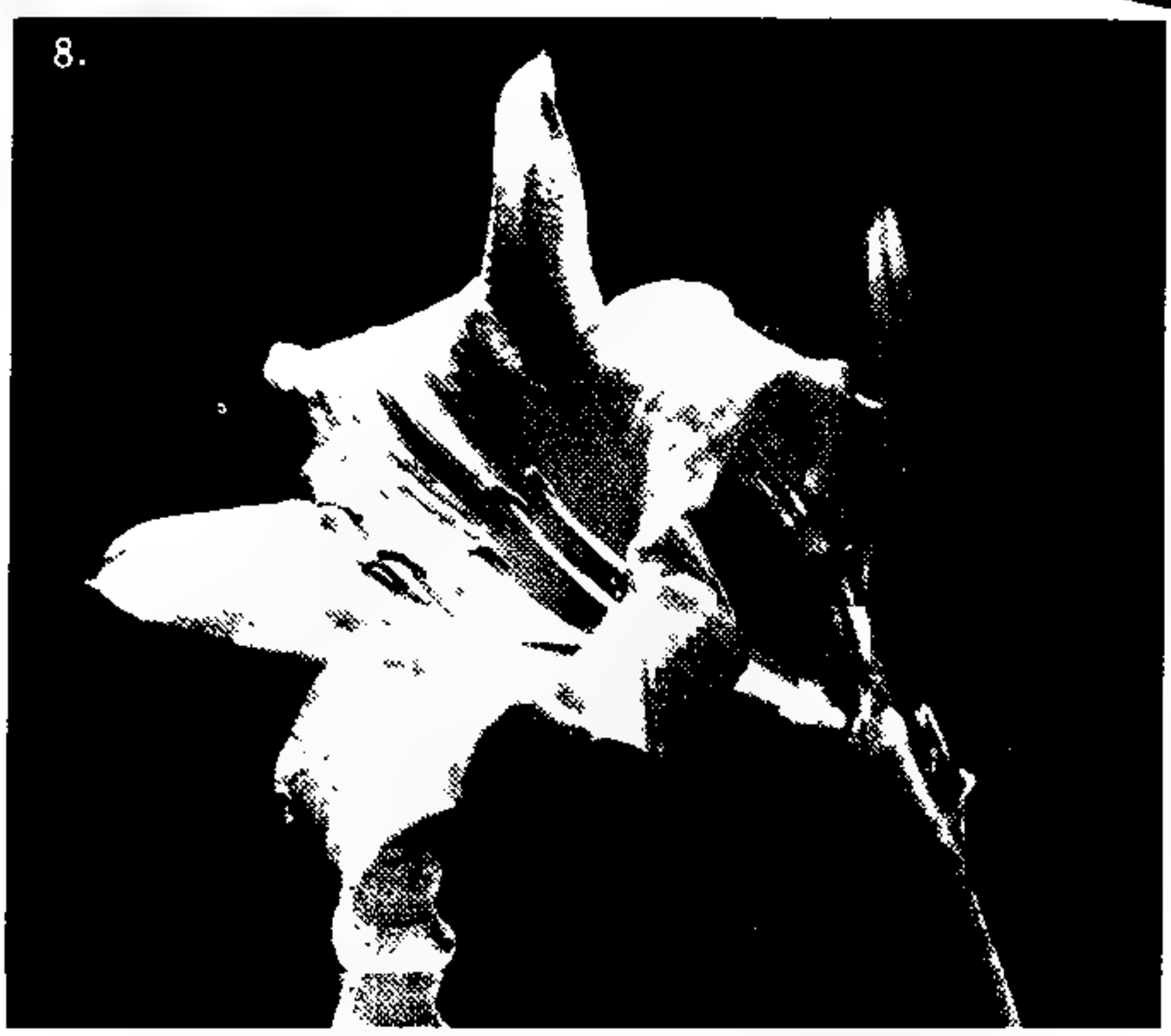
Photographs by
Fleda Griffith

Flowers shown at exactly half natural size.

5.

6.

7.



8.

GROWTH HABITS OF THREE OF THE NEW DAYLILIES

9 *(Left above)*: *Hiawatha.*

10 *(Right above)*: *Bicolor.*

11 *(Right below)*: *Buckeye.*

The two upper plants both stand about 40 inches high; Buckeye about 30 inches.

pigmentation in the flowers were brought together by hybridization and selective breeding into relations which produced a type of flower that had hitherto not been in existence. Several of the more deeply red-colored clones of the present introductions have a similar origin and for others there has been selective breeding for other shades in red.

In the daylilies any individual of unusual character or special merit for garden culture is propagated or multiplied by vegetative divisions to give a clone all members of which are merely branches of the one original seedling. In nearly all cases the clones of hybrid origin do not breed true from seeds.

Afterglow Daylily. The flowers of this daylily are of medium-large size and they have a most unusual coloring for daylilies. The general tone is near capucine yellow: a sort of pale buff and pastel shade which extends well into the throat, where there is a delicate but definite rosy or pink tint which is slightly more pronounced along the midvein of the petals. The scapes rise to a height of 44 inches, and there are as many as 15 flowers in the two or three flowering branches that form an inflorescence. The period of flowering has extended from early July until August 12.

Aladdin Daylily. (Cover photograph) In the flowers, which have a spread of about 4 inches, there is a broad conspicuous mid-zone of garnet-brown in each petal and a lesser one in each sepal; the outer half of the face of the flower is golden cadmium with tinges of red-fulvous which are slightly stronger in the sepals. Thus the pattern is strongly banded but different in tones from both the ***Mikado*** and ***Buckeye Daylilies.*** The scapes rise to 45 inches and are rather short-branching with flowers somewhat clustered. The season of bloom is mostly in late June. The plant is nearly evergreen but suffers only slightly from winter injury.

Autumn Prince Daylily. The flowers are clear light yellow in color (a self-pattern) and of medium-small size. The season of flowering is in late summer and autumn (from early August on into early October). The scapes are stiffly erect, tall (to 42 inches), and much branched. The foliage is fully dormant in winter when the buds are submerged.

Baronet Daylily. A concentric and sharply contrasted two-toned pattern marks this flower; there is an orange throat outside of which both the sepals and petals are a sprightly fulvous red of the shade near Brazil red (Ridgeway). The petals are wide, semi-rounded, and recurving and the flower is full. The much branched scapes rise to a height of 28 inches and are scarcely taller than the foliage. The season of flowering is June

Bertrand Farr Daylily. The flowers are of medium size and full with all petals and sepals gracefully recurved. The throat of the flower is pale orange outside of which the coloring is near grenadine pink (Ridgeway) or salmon red (between numbers 13-2 and 13-3 of the R.H.S. charts) but with darker red coloring in the veins. The scapes are well branched but only about 30 inches tall. In well grown plants the flowers are numerous and somewhat massed at a low level in a way that attracts attention. The period of flowering is in July. The propagations of this plant under selection at the nurseries of the Farr company have been much admired by members of that firm and by various visitors. This seedling is one of numerous individuals obtained by cross-breeding the ***Patricia*** with the ***Charmaine Daylily.***

Bicolor Daylily. (Fig. 10) Two colors with radial distribution enter into the pattern of the open flowers of this daylily. The sepals and throat and a stripe extending out along the midrib of each petal are yellowish orange; the petals outside of the throat and the stripe are of a pale fulvous red tinged with rose. The flower is full and somewhat cup-shaped with noticeably rounded petals. The scapes rise to about 40 inches and are well branched. The season of bloom has been chiefly in July and August.

Brunette Daylily. (Fig. 5) Of the selections named at the New York Botanical Garden this is the first which has a decidedly and general chocolate shade of coloring. A discarded seedling of our earlier selections, which was afterwards named ***Brownie Daylily,*** is somewhat of the same class but is much less strongly colored. The throat of the ***Brunette Daylily*** is yellowish orange; there is a large mid-zone of a shade near madder brown outside of which the blade is a lighter shade of tan-red or brownish red. The pattern is hence concentric and is three-toned and banded. The period of bloom is early, beginning about June 1. The flowers are medium-small (about 3½ inches in spread), medium-full, and widely open. The scapes are much branched and usually stand only from 24 to not more than 30 inches tall.

This plant is a complex hybrid with an ancestry that includes *H. flava, H. fulva* clone ***Europa***, *H. aurantiaca,* and *H. Middendorffii.* Also in the ancestry are six different seedlings some of which are selections for early flowering, semi-dwarf stature, and dark flower coloring.

Buckeye Daylily. (Figs. 3 and 11) The color pattern in the flowers of this daylily is boldly banded with a broad mid-zone in the petals of garnet-brown which is in sharp contrast to the clear cadmium-yellow (which is a shade of orange) of both the throat and the outer part of the open flower. Also the color of the throat extends or radiates rather prominently along the midvein of each petal. There is only slight banded coloring in the sepals. The flowers are clustered in a manner that brings the flowers of the different scapes into a somewhat compact group at nearly the same level. The scapes reach a height of 30 inches. In winter the foliage is fully dormant. The plants flower chiefly in late June. The flower coloring resembles that of the ***Mikado Daylily*** but the season of flowering is earlier and the habit of growth is different. In the ancestral pedigree of this plant there are *H. flava, H. fulva* clone ***Europa,*** *H. aurantiaca,* and *H. Middendorffii.*

Dominion Daylily. (Fig. 2) This is an outstanding daylily for medium-large full flowers with rich red coloring in a concentric three-toned pattern. Outside of a throat that shades into orange the sepals and petals are garnet-brown with a darker mid-zone that approaches maroon in the petals. The foliage is semi-evergreen. The scapes rise to 40 inches. The main season of flowering has extended from June 21 until the middle of July but there has been a second period of less profuse and rather irregular bloom which has extended from mid-August until severe freezing temperatures in November.

Harlequin Daylily. The blades of the petals are rather uniformly red, of a shade near to carmine and to English red of Ridgeway, and to the vermilion of the Garden Dictionary. The throat and sepals are golden yellow except for a few red streaks in the sepals. Thus the pattern is a bicolor in two tones that are concentric in the petals. The flowers are medium-large (to about 6 inches in full spread) with petals rather long and recurving. The scapes are nearly 4 feet tall. Compared with the ***Bicolor Daylily*** the red coloring is darker and the shape of the flower is quite different. The plant has robust stature (about 40 inches) and the flowering is mostly in July, but may extend into August.

Hiawatha Daylily. (Fig. 9) The numerous medium-small flowers (3½ inches in spread), of the branching, upstanding scapes are carried to a height of about 40 inches. Their color is almost uniformly a golden orange, of a shade between orange and cadmium-yellow (Ridgeway) and close to tangerine-orange (R.H.S.). At the New York Botanical Garden the climax in flowering for this daylily has been during the latter half of July. The habit of growth is much like that of *H. multiflora* and the group of the ***Summer Multiflora Hybrids,*** but this plant is taller and the flowers are somewhat larger, and the period of blooming is earlier than for *H. multiflora.*

Mignon Daylily. (Fig. 6) This plant is rated as the best of the present selections for small yellow flowers in a plant of rather tall stature and a long period of flowering. The precise shade of coloring is very nearly lemon chrome (Ridgeway) with a slight change toward green in the base of the throat. There is some brownish red on the flower buds which persists on the sepals of the opened flowers. Many of the flowers have a spread of only 1 to 1½ inches, and seldom have flowers measured 2 inches. They are full and spreading, and normally open about dusk and continue widely open and in good condition throughout the following day until sunset or even after dark, depending on the weather. On many days there are two sets of flowers open for a time in the evening. The scapes are much branched and slender, but stiffly unstanding to a height of 40 inches. The period of bloom for well developed plants at the New York Botanical Garden has continued from mid-June until in August. In the group of ramets of this clone in the propagations at the Farr Nursery the flowering has continued throughout August and on into early September. The foliage is dormant in winter and the plant is fully hardy.

Monarch Daylily. (Fig. 7) The flowers of this daylily have individual character and special charm in their form. They are full, and while the sepals are recurved, the petals are only semi-spreading and noticeably incurved near their tips. The general coloring is close to light cadmium (Ridgeway) or the lemon yellow 4 of the R.H.S. chart, and there is a faint halo of fulvous in the region of the mid-zone. The scapes are stiffly upright

to a height of 3 feet and are much branched. The plants of this clone flower during July.

Port Daylily. (Fig. 4) This is an outstanding red-flowered daylily with sturdy much branched scapes usually from 2 to not more than 3 feet tall. The flowers are medium small (about 3 inches in spread), full, and of a rich sprightly red that is near the Brazil-red of Ridgeway. The color is slightly darker in the mid-zone, which extends somewhat into a shallow throat of greenish orange. The foliage is coarse and rather upstanding with the tips extending into the level of the flowers. The period of bloom is throughout July. The flowers are widely open during the hours of daylight but close soon after dark. This plant was admired by Mrs. J. Norman Henry who suggested that it be named ***Port Daylily*** in memory of her youngest son, Frederick Porteous Henry.

Red Bird Daylily. The dominant flower coloring of this seedling approaches vermilion-red with a somewhat deeper shade in the mid-zone. Several selections of this particular class for color have been under evaluation for several years. This is the first of these that is now ready for introduction. The foliage is evergreen; the scapes stand about 3 feet tall; and the season of flowering is in July. In the ancestry of this plant are *H. flava, H. aurantiaca, H. fulva* clone ***Europa,*** and three different wild plants of *H. fulva* including the ***Rosalind Daylily.***

Sachem Daylily. (Fig. 1) This plant has tall (40 inches), much branched scapes. The flower buds are reddish brown; the open flowers are of medium size (about 4½ inches spread), full, and the color in the face outside of the throat is nearly uniformly dark red of a shade between garnet-brown and maroon of Ridgeway and near the carmine of the Garden Dictionary. The throat of yellowish orange is in sharp contrast to the outer zone of red. Thus the pattern is concentric and two-toned. The red coloring is near that of the ***Vulcan Daylily*** but without a midband; the shape of the flower and the habit of growth are also quite different. The flowers hold color and form throughout the day even in hot weather, and they close after the sun sets. The period of bloom is chiefly in July.

Symphony Daylily. The foliage of this plant is fully dormant during the winter and the buds are submerged. The scapes rise to a height of 44 inches and are well branched. The flowers are medium-sized (about 4½ inches), medium-full and widely spreading. They are somewhat bicolored: that is, the sepals are almost yellow; the petals are greenish yellow in the throat, rose-tinted in the blade, and there is a somewhat narrow but noticeable mid-band of darker red. The various colors are delicately blended. The flowers open in the evening and remain in excellent condition until about dark the following day. The period of flowering is from the middle of June until the middle of July. The general character of the flower coloring is similar to that of the ***Linda Daylily;*** but the coloring is more delicate, and also the scapes are taller and the season of flowering is earlier.

Triumph Daylily. (Fig. 8) The form of the flowers of this daylily is somewhat special and individual. The petals are broad, strongly recurved, and often somewhat folded back along the edges ("pinched"), but the sepals stand semi erect. The flower is medium-large (5 inches in spread), and the color is a rich orange with a slight fulvous halo in the region of the mid-zone. The flowers are widely open and in good condition throughout the day but they close promptly at dusk. The coarse scapes rise to 40 inches and are well branched. The season of bloom is July.

Yeldrin Daylily. The flowers are rather small and full with a spread of about 3 inches; the color in the entire face is very uniformly yellowish orange, close to the empire yellow of Ridgeway; the buds and backs of the sepals are noticeably brown-red. The scapes are much branched and rise to a height of 40 inches. The season of bloom has been in late July until mid-August.

Zouave Daylily. At the New York Botanical Garden this daylily has been in bloom throughout June, with a second period of considerable bloom in September. The flowers have a spread of about 3½ inches; the color of the petals is rich fulvous red with a somewhat darker mid-zone; the sepals have less color, and hence the general color-pattern is somewhat bicolor. The scapes are much branched and they rise to a height of 40 inches.

"Gardens And Plant Lore Of Mediaeval Europe"

Lecture Series To Be Given In Spring For Members of Botanical Garden And Metropolitan Museum

FIVE weekly lectures for members of the New York Botanical Garden and of the Metropolitan Museum of Art will be given at the Cloisters in Fort Tryon Park, Manhattan, and at the New York Botanical Garden, in Bronx Park, in the spring through the collaboration of the two institutions. The program, which has been built upon a recent study of the flora of the Unicorn Tapestries at the Cloisters, made by E. J. Alexander and Carol H. Woodward, is to be entitled "Gardens and Plant Lore of Medieval Europe." Tea will be served after each talk. Tickets for each of the five lectures will be issued by the Metropolitan Museum and by the Garden for their members, who are asked to apply to the Secretary of their own institution for the tickets, indicating dates for which they wish to make reservations. A special announcement of the series will be sent to members early in April.

The lectures, which will all be given on Thursdays at 3 p.m., will be as follows:

April	24	***Plants of the Unicorn Tapestries*** At the Cloisters	E. J. ALEXANDER, *Assistant Curator, New York Botanical Garden*
May	1	***Herbs and the Mediaeval Feast*** At the Cloisters	MARGARET B. FREEMAN, *Instructor, Metropolitan Museum of Art*
May	8	***Medicinal Herbs and Mediaeval Herbals*** At the Botanical Garden	HELEN NOYES WEBSTER
May	15	***Mediaeval Plant Lore*** At the Cloisters	RACHEL MILLER HUNT
May	22	***Gardens of Cloisters and Castle*** At the Botanical Garden	H. W. RICKETT, *Assistant Bibliographer, New York Botanical Garden*

Mrs. Hollis Webster, of Lexington, Mass., who will speak on May 8 at the Garden, has lectured extensively on herbs and is the author of "Herbs: How to Know Them and How to Use Them," published in 1939 by Hale, Cushman & Flint. This book was enlarged from a pamphlet originally written by Mrs. Webster and published by the Massachusetts Horticultural Society.

Mrs. Roy Arthur Hunt, whose home is in Pittsburgh, possesses one of the finest private collections of gardening books and old herbals in the country. She is editor of the department called "Garden Literature" in the Bulletin of the Garden Club of America, and has written many articles on early herbalists and garden writers for the Bulletin.

Herbarium Receives 2,000,000th Specimen At Ceremony Following Addresses

THE two millionth specimen was formally incorporated into the herbarium at the New York Botanical Garden at a ceremony in the Museum Building Wednesday afternoon, Dec. 11. After a program in which Dr. William J. Robbins, Dr. J. H. Barnhart, and members of the taxonomic staff took part, Mr. Joseph R. Swan, President of the Board of Managers, placed a sheet of heavy white paper bearing a specimen of *Clematis versicolor* in its proper folder in the herbarium. The hundred guests assembled then had tea in the Members' Room.

The story of this specimen, as told in the invitation to the program, is as follows:

> *For forty-five years the herbarium of the New York Botanical Garden has been growing at an average rate of more than forty thousand specimens a year. When its progress for 1939 was summarized, it was obvious that the two-million mark would be reached before the end of 1940. In the autumn it was seen that a collection of some fifteen hundred specimens from the northeastern states made by H. A. Gleason, Head Curator, during the previous summer, would carry the herbarium over the mark. Among this lot, the specimen which proved to be the two millionth was a plant of a little known wild clematis,* Clematis versicolor, *collected at Russellville, Kentucky, June 26.*
>
> *In addition to the purely accidental honor of being No. 2,000,000, this specimen is otherwise noteworthy, for it represents a comparatively rare species, first introduced to science in 1901 by the late Dr. John K. Small, Curator, who for forty years was on the staff of the New York Botanical Garden. Since that time it has been known only from the Ozark region of Missouri and Arkansas, and this Kentucky plant is apparently the first record of its existence east of the Mississippi River.*

The program took the place of the regular monthly conference of the staff and registered students of the Garden.

Since number 2,000,000 was put in its niche, there have been 19,000 more specimens added to the herbarium, keeping it in its place as the largest herbarium under one head in the United States. While the United States National Herbarium contains a few more specimens of flowering plants, the herbarium at the New York Botanical Garden ranks first in the country in plants of certain regions; for example, the southeastern states, the West Indies and Bolivia, and in the flora of Asia. It also stands first in mosses and in myxomycetes, and ranks among the first in its collections of algae and fungi.

The herbarium now contains 1,383,833 specimens of flowering plants and ferns; approximately 177,000 mosses; 61,400 liverworts; 87,500 algae; and nearly 305,000 fungi, including lichens, making a total of 2,019,000 specimens.

The program of addresses, given in the lecture hall, was opened, after

a brief introduction by Dr. Robbins, by Dr. J. H. Barnhart, who spoke on the "History of the Garden Herbarium." He was followed by Dr. H. N. Moldenke on "Important Collections in the Garden Herbarium." E. J. Alexander spoke on "Relation of the Herbarium to Horticultural Progress" and Dr. W. H. Camp, whose address because of his illness was read by Dr. H. W. Rickett, on "The Herbarium in Scientific Research." Dr. H. A. Gleason's subject was "Important Publications from the Garden Herbarium." In his closing remarks Dr. William J. Robbins, speaking on "Significance of a Herbarium," mentioned the special research being done by each member of the taxonomic staff.

These addresses will be given in full in this and subsequent numbers of the Journal.

Attending the program, in addition to members of the Garden and of the Torrey Botanical Club, were representatives of each of the botanical institutions and the college and university departments of botany in New York and its vicinity.

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*History Of The Garden Herbarium**

By John Hendley Barnhart

IN January, 1896, an agreement between the Garden and Columbia included a provision that the herbarium of Columbia should be deposited with the Garden. Although Bronx Park had then been selected as the site of the future botanical garden, work on the grounds and buildings had not been started, so the actual transfer of the Columbia herbarium did not take place until several years later.

However, the accumulation of materials for a Garden herbarium was begun during the same year, 1896, and proceeded with astonishing rapidity. It was planned from the beginning to include all groups of plants, the Columbia herbarium being restricted chiefly to flowering plants, ferns, and mosses. It is not strange, therefore, that one of the first purchases was the fungus collection, consisting of about eighty-five thousand specimens, of the late J. B. Ellis; and later many other entire herbaria were acquired. There have been, throughout the later years (now nearly half a century), four principal sources of accessions to the Garden collections of dried plants: first, purchases; second, gifts; third, exchanges; and last but by no means least, the incorporation of specimens brought back by collectors and expeditions sent out by the Garden or subsidized by it. At the end of the year 1896 there were already about 100,000 herbarium specimens belonging to the Garden; by the end of 1899, the total had reached 225,000, of which more than half had been mounted.

During this preliminary period the Garden had maintained offices, and it was in these that the specimens were mounted and arranged. The first office was in one of the old Columbia buildings on East 49th Street near Madison Avenue; when this was demolished, the office was installed in a house a few blocks west of the Garden site, in what was then called Bedford Park Village. It may not be uninteresting to note in passing that three young men employed to work on the Garden herbarium in those earliest days are still living. One[1] established, 40 years ago, a popular botanical periodical

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* This was the opening address at the program in celebration of the incorporation of the two millionth specimen in the herbarium at the New York Botanical Garden.

[1] Willard N. Clute.

that he still edits. Another[2] has been for 42 years connected with the United States National Herbarium, of which he is now in charge. The third[3] afterward studied both pharmacy and medicine, and is today, in his chosen fields, one of the most famous citizens of New York.

It was late in 1899 that the Museum Building approached completion, and it became possible to commence the installation of the collections in their permanent home. By the end of the year the building contained all of the Garden herbarium and most of the Columbia herbarium as well. The latter was, and of course remains, of immense importance, both because of its size and of its historical value. At the time of the transfer it contained more sheets than the Garden collection; among these were many critically studied, annotated, and made the basis of published papers, not only by John Torrey but by numerous later workers. Its history, from its beginnings as Torrey's personal herbarium, now covers much more than a hundred years.

A valuable record of the combined herbaria was presented in March, 1900, in the third number of the Journal of the Garden. At that time all of the collections were housed in the large east room on the top floor of the Museum Building. As the herbarium grew, the ferns, mosses, and lichens were put into the adjoining taxonomic laboratory, and the fungi and algae were given space in the room at the west end of the second floor. The flowering plants overflowed into the hall, and crept along one side of it to the west end, eventually partly filling the room that was originally planned, with its tiled floor, as a physiological laboratory. During the directorship of E. D. Merrill, and because of his interest in the eastern Asiatic and Polynesian floras, a separate Oriental Herbarium was arranged in the east end of the second floor; and, later, into the same room went the ferns and, finally, most of the monocotyledons.

At first the Columbia and Garden herbaria were kept distinct; this was because the Garden sheets were a trifle larger and did not fit into the old cases. Some years ago, however, new cases permitted the rearrangement of both collections, with the exception of the Oriental Herbarium, in a single series. This contributes decidedly to the convenience of workers. It would be no little task now to separate the two herbaria, but it could be done unerringly, for each sheet bears indication of its ownership. During the present year the location of the component parts of the herbarium has been completely changed. The cryptogamic collections now occupy the east end of the top floor, while nearly all of the second floor is devoted to the flowering plants.

Herbarium cases are an important problem. Those at Columbia were made of wood, and the same material has been used for most of those at the Garden. At the time when the Oriental Herbarium was being organized, the Garden could not afford new permanent cases, and resorted to temporary ones made of corrugated pasteboard. These are still in use, but they constitute a serious fire-hazard. Modern herbarium equipment demands steel cases, but until very recently there were none of these in the Museum Building except the few on the first floor that are devoted to the Local Herbarium; these were provided by a special bequest of the late W. C. Ferguson. During the past year a beginning has been made toward providing steel cases for the main herbarium.

Several parts of the herbarium have received special names in commemoration of former members of the Garden staff. The first to be so honored was Professor L. M. Underwood, who died in January, 1907. A year later the entire fern collection was officially designated the "Underwood Fern Herbarium", and a bronze tablet was duly installed recording the fact. In 1934, Mrs. Britton's work was commemorated in the naming of the moss collection as the "Elizabeth Gertrude Britton Moss Herbarium," and in the following year the general herbarium was designated the "Britton Herbarium" in memory of our first Director.

The combined herbaria now contain two million specimens. This is true of no other herbarium in America, and not more than five or six in the Old World. In certain departments, as in flowering plants and in fungi, there are two or three larger accumulations in this country. On the other hand, in some fields, as the mosses, it is believed that there is no collection as large anywhere in the world.

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[2] William R. Maxon.
[3] Walter A. Bastedo.

Sunday Morning Tours of Conservatories To Be Inaugurated Next Month

BEGINNING Feb. 9, there will be a series of bi-weekly tours of the Main Conservatories at the New York Botanical Garden under the guidance of Howard Swett of the horticultural staff. On each trip a special group of plants will be subjected to observation, as to their forms, colors, and habits of growth, their geographical background, uses, and occasionally their culture, with the idea of creating an inquisitiveness about others.

The tours will start from the central dome at 11 a.m., in order to avoid the Sunday crowds that begin shortly after noon. While they will be free, they will be limited to twenty persons, so it will be necessary to write in advance for tickets of admission, which will be issued by the Horticulturist in the order received. The subjects of the four tours now scheduled will be as follows:

Feb. 9. Plants that are useful to man. This will be a lecture tour through the conservatories to introduce a group of important economic plants, such as the banana, rubber, chicle, vanilla, Panama-hat plant, ginger, and others. Included among the economic plants of world importance will be some that are made interesting by local use or association, such as the Egyptian papyrus.

Feb. 23. Decorative plants for the conservatory. The second tour will be organized to emphasize the variety of decorative plant material which may be grown under glass—especially the more unusual plants which can be seen in few other public or private conservatories.

Mar. 9. Plants of the desert regions. The third tour will introduce groups of plants and interesting individual specimens which inhabit the arid regions of both the Old and New Worlds. These will include the cacti of the Americas, the stone plants and windowed plants of the South African deserts, the aloes of Old World regions, the euphorbias with their myriad curious forms, and the rosette-like echeverias.

Mar. 23. Plants in relation to their environment. Exhibits in the Tropical Flower Garden, the Aquatic House, Tropical Rain Forest, Palm House, and the three Succulent Houses will be studied during this tour.

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Current Literature At a Glance*

Honor. Dr. George H. Shull, Professor of Botany at Princeton, was honored at a banquet in Chicago in November in recognition of the distinction accorded him of being the "father" of hybrid corn. Thirty-five years ago, according to the editor of *Seed World* in the issue of Dec. 13, Dr. Shull conceived the idea of producing outstanding inbreds and then crossing them to produce a hybrid corn of excellent quality. Within recent years the corn-growing industry has been revolutionized through the use of Dr. Shull's methods, it was said.

Greenhouse Culture. The forcing of Easter lilies, with special attention to their temperature requirements, is treated in Bulletin 376 from the Massachusetts Agricultural Experiment Station. In Bulletin 375 on biological control of mealybugs, it is told how the imported ladybird beetle has been effectively used in greenhouses.

Virus Immunity. W. C. Price of the Rockefeller Institute contributes "Acquired Immunity from Plant Virus Diseases" to the September number of *The Quarterly Review of Biology.* To quote from his part of summary: " . . . actively acquired immunity from plant virus diseases has been satisfactorily demonstrated. In contrast, passively acquired immunity has not been demonstrated. Immunity that follows recovery from certain plant virus diseases is of the carrier type. Cross immunity, or the inhibition of virus development in a plant cell already infected with a closely related virus, may be either of the carrier or chronic-disease type."

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* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

A New Volume Hailed With Reprint of An Old One

ILLUSTRATED FLORA OF THE PACIFIC STATES. LeRoy Abrams. Revised edition of Volume 1, Ferns to Birthworts. 538 pages, illustrated with 1,299 figures, indexed. The Stanford University Press, California. 1940. $7.50.

It is with considerable satisfaction that we hail the appearance of the reprinted edition of the first volume of Dr. Abrams' important Illustrated Flora of the Pacific States. This new printing has been done by the offset process on a much better grade of paper than was used for the original printing. A number of typographic errors in the text have been corrected and the nomenclature has been brought into accord with the present edition of the International Rules. Family keys and comprehensive indices to the English and Latin names have been omitted because they will all appear together in the last of the four volumes. A few errors still remain –for instance, the generic names *Vagnera* and *Unifolium* still appear in the key genera of Convallariaceae on page 449, although these names have been changed to *Smilacina* and *Maianthemum* on pages 453 and 454

The price for this volume has been reduced to $7.50. Volume 2, describing and illustrating 1,655 more species, from the buckwheats to the kramerias, is announced for December publication and will be reviewed in these columns within a few months. Volumes 3 and 4 are in preparation.

H. N. Moldenke.

Pesky Pests

INTRODUCING INSECTS. James G Needham. 129 pages, illustrated and indexed. The Jaques Cattell Co., Lancaster, Pa 1940. $1.50.

A famous authority on insect life has prepared a convenient handbook of the pesky creatures that make our lives miserable by destroying our best woolen coat, by spoiling the potato patch, by making a beautiful apple "wormy", or eating up the nuts before we can get around to them.

This book not only gives us interesting life-history facts about butterflies, grasshoppers, weevils, dragonflies, beetles, scale insects, aphids, mosquitoes, house flies and other common insects, but gives useful advice about how to control them. The information on how to collect insects and how to maintain an insect collection is included in order to interest the young mind, because from young collectors grow famous naturalists in later years.

This book is useful as an introduction to insects for both youngsters and oldsters; it will make a valuable addition to the "household aid" shelf because every householder, sooner or later, must cope with the pests described here.

Elfanor King.

Notes, News, and Comment

A.A.A.S. At the Philadelphia meetings of the American Association for the Advancement of Science at the close of the year, the New York Botanical Garden was represented by a dozen staff members and nine other persons at present associated with the institution. They were Drs. William J. Robbins, H. A. Gleason, F. J. Seaver, A. B. Stout, J. H. Barnhart, H. W. Rickett, H. N. Moldenke, W. H. Camp, F. W. Kavanagh, Stanley R. Cain, E. H. Fulling, Clyde Chandler, Ellys T Butler, Virgene Kavanagh, Roberta Ma, and Dorothy Day; also present were Messrs. Robert Hagelstein, Joseph F. Burke, John Dwyer, J. P. Carabia, and Thomas Laskaris. Dr. Camp spoke before the Botanical Society of America on "The Species Problem in *Fagus*," and Mr. Dwyer gave "A Preliminary Report on the Genus *Ouratea* in Tropical America." Dr. Seaver reported on *Mycologia*, of

which he is Editor, to the Mycological Society of America.

Library. Sunday afternoons from 1 to 4:30 the library of the Botanical Garden will be open for reference work and reading. The new regulation went into effect the first of the year. A member of the library staff will be in charge each week.

Degrees. Doctor of Philosophy degrees have been awarded to Miss Clyde Chandler and Miss Ellys T. Butler, both of whom did their Columbia graduate work at the New York Botanical Garden. Miss Chandler's paper, entitled "Microsporogenesis in Triploid and Diploid Plants of *Hemerocallis fulva*," was published in the November number of the Bulletin of the Torrey Botanical Club. Miss Butler's thesis, "Studies in the Patellariaceae," appeared in the November-December issue of *Mycologia*.

Lecturer. Dr. Firman E. Bear, Head of the Department of Soils and Crops at the New Jersey State College of Agriculture, addressed the Saturday afternoon lecture audience Dec 14 on "Plants and the Course of Civilization." Dr. W. H. Camp, who was scheduled to give this lecture, was prevented from appearing because of illness.

Visitors. The nearness of the winter meetings of the A.A.A.S. in Philadelphia brought a large number of visitors to the New York Botanical Garden during the holiday season. Among those who registered in the library and in the mycological herbarium from late November on were M. A. Chrysler of Rutgers University; Frank E. Egler of Syracuse; Margaret Ibright, Yale; Frances J. Clark, Connecticut Agricultural Experiment Station; George Rowley, Princeton; E. Kostal, Bureau of Entomology and Plant Quarantine, Hoboken; C. Stuart Gager, Brooklyn Botanic Garden; Harold C. Bold, Barnard College; R. T. Clausen, Bailey Hortorium, Cornell; Lincoln Constance and Ralph W. Chaney, Berkeley; Milton Hopkins and G. L. Cross, University of Oklahoma, Norman, Okla.; Sam J. Grober, College Park, Md.; E. E. Naylor, University of Missouri; George E. Wheeler, University of Pittsburgh; Joseph Ewan, University of Colorado; F. R. Fosberg, Bureau of Plant Industry, Washington; James Bonner, Pasadena; L. O. Overholts, State College, Pa.; R. W. Poulter, Iowa City; J. Richard Carpenter, Black Mountain College, N. C.; Ada Hayden, Iowa State College; Marion A. Johnson, New Brunswick, N. J.; William J. Gilbert, University of Michigan; A. Gershoy, University of Vermont, and J. P. Anderson, Juneau, Alaska.

Bermuda Lecture. The lecture on "Scenery and Gardens in Bermuda" to be given by Dr. Fred J. Seaver, will take place on Jan. 25, at 3 p.m. in the Lecture Hall, as announced on page 290 of the December Journal; not on Jan. 18, as was stated on page 295. Dr. Seaver, who returned from Bermuda just before Christmas, will show 100 new kodachrome slides which he took while there.

Field Botany. The spring term of the course in Field Botany offered by the Garden under the direction of Dr. W. H. Camp will begin on Feb. 15. The class will meet on Saturdays at 1 p.m. for lectures, demonstrations, herbarium studies, and field trips to take place on nine Saturdays to be arranged between the opening date and June 7. The minimum registration accepted will be 20 students; the maximum, 25. The fee is $10, with New York City teachers, who may receive "alertness" credit, admitted at half price.

Advisory Council. Mrs. Robert H. Fyfe was elected Chairman of the Advisory Council at the annual meeting Dec. 4. The retiring chairman, Mrs. Elon Huntington Hooker, became First Vice-chairman. Mrs. Carl de Gersdorff remains in her post as Vice-chairman; Mrs. F. Leonard Kellogg as Treasurer; Mrs. Nelson B. Williams, Recording Secretary, and Mrs. Townsend Scudder, Corresponding Secretary. The Executive Committee for 1941 consists of Mrs. George McM. Godley, Mrs. William A. Lockwood, Mrs. Henry J. Fisher, Mrs. Gilbert Montague, Mrs. Henry St. Clair Putnam, and Mrs. Henry F. Schwarz. A feature of the meeting was an address and demonstration on "Economical Flower Arrangements" by Mr S. Gerard Smith. The meeting was at the home of Mrs. Richard de Wolfe Brixey.

THE NEW YORK BOTANICAL GARDEN

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Until 1942: ARTHUR M. ANDERSON (*Treasurer*), PIERRE JAY, CLARENCE LEWIS, E. D. MERRILL, HENRY DE LA MONTAGNE (*Secretary and Assistant Treasurer*), FRANCIS E. POWELL, JR., and WILLIAM J. ROBBINS.

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by descriptions.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays, programs, lectures, and other events at the Garden.

(5) Credit to the amount of the membership fee paid, toward courses of study offered by the Garden.

(6) The privilege of borrowing lantern slides from the Garden's collection.

(7) Use of the Members' Room in the Museum Building.

A limited number of garden clubs are accepted as Affiliates. The privileges of affiliation are one lecture a year by a member of the staff, a share in the distribution of plants when they are available, a subscription to the Journal and to Addisonia, and announcements of special activities at the Botanical Garden. In addition, any member of an affiliated club may enroll in one of the Garden's study courses each year for one-half the regular fee. An affiliate Garden Club may borrow lantern slides from the Garden's extensive collection, such loan being subject to the regulations for the use of lantern slides by individual members. Likewise, an affiliate club may engage the Members' Room at the Garden for its meetings.

The classes of membership are as follows:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Affiliation	annual fee for club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

Contributions to the Garden may be deducted from taxable incomes The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of - - ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor
February 1941

VIEW IN THE CACTUS HOUSE IN THE MAIN CONSERVATORIES
Cover Photograph by Fleda Griffith

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FOR FUTURE BOTANISTS

For 42 years, Henry Hurd Rusby was a professor and dean, directing studies in pharmacognosy and materia medica, but for 75 of his 85 years he was also essentially a botanist—a child-botanist in his early years, but very soon of mature enough intelligence in the field to rank with the professional men.

Throughout his life, plants comprised the constellation which he followed. Exploring and collecting helped him to earn much of his way through school. His knowledge of botany gave him the background he needed for his scientific expeditions into the jungles of South America. It made him able to identify and appraise the thousands of specimens that he collected; made it possible for him to apply some of those plants to the more beneficial practice of pharmacy and medicine. And after he retired, he turned again to plants as one of his most satisfying pastimes. All this came from a healthy boyish curiosity about what made them grow and bloom.

When he was a lad there was no such place as a large botanical garden to which he could turn for inspiration and knowledge. A sympathetic teacher and a copy of Gray's Manual were the only guides he had in his beginning years. Later, feeling the need for such an institution for future students, he became one of the men who helped to organize and develop the New York Botanical Garden and to fill its herbarium with specimens of plants he had discovered

Today the New York Botanical Garden, with its increasing facilities of herbarium, library, and laboratories, stands ready to be the guiding hand for young men who wish to follow in Rusby's footsteps and become useful botanists either as a profession or avocation.

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JOURNAL
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Succulent Plants At The Botanical Garden

CACTI and other types of succulent plants have always formed an important part of the collections in the conservatories at the New York Botanical Garden, both for their popular interest and their scientific value. As one example, much of the research for "The Cactaceae," four-volume work by N. L. Britton and J. N. Rose, was based on plants being grown in the Botanical Garden's greenhouses.

During the past few years the collections of succulent plants have been steadily built up, largely by exchange and gift, until they rank among the most complete in the country. With this increase in numbers, the character of the displays has been altered, emphasis now being placed on a naturalistic arrangement of the plants.

All of the specimens formerly were grown in pots on the greenhouse benches, but beginning in 1934 the central portion of each house containing succulents was made into a large open bed where the cacti and other fleshy subjects were planted out under much the same conditions they would find in their arid homes. The result has been that sturdier plants of more characteristic shape have been developed, and that more and more of the plants have come into bloom each year — some recorded for the first time under cultivation.

Of the 1,600 different species represented, about 600 are of the desert types of cacti, all natives of the Americas. They occupy House 7 in the Main Conservatories, near the Third Avenue Elevated entrance to the grounds. On one side of them, in House 8, are other succulent plants of the New World, such as the century-plants, yuccas, echeverias, and their relatives, while on the other side, in House 6, are grouped the succulent plants of the Old World, chiefly from the South African deserts. These include the stone plants and windowed plants, the aloes, euphorbias, stapelias, mesembryanthemums, and many other familiar types.

It is planned to treat each of these three groups in this Journal during 1941. The opening article, dealing with the desert-dwelling members of the Cactus family, is presented here.

Those who visit the cactus collection will find, besides the naturalistic grouping in the large central bed, a number of specimens still being grown in pots on the side benches. The pereskias, prickly-pears, and the columnar and climbing cerei are on the south side; the melon, globular, and dwarf-growing types on the north side. Here, on the west end, the mammillarias are planted out. At the east end there is a space devoted to the raising of cacti and other types of succulent plants from seed, where every stage in the growth of the plants may be seen, from the tiniest seedlings to the size at which they are ready for separate potting.

Desert Cacti Of The Americas

By E. J. Alexander

CACTI are one of America's greatest gifts to the horticultural world. Startlingly different in both form and flower from any other plants, they form a unique and distinct group in the plant world. With an ancestry veiled in geological mist, they are an outstanding feature in the regions where they occur in quantity, and a bizarre element where they occur as occasional units. They have solved the problem of life in a hostile environment in a manner that renders them a prime example of nature's adaptability to extreme conditions of drought, and their flowers, though frequently fleeting, are among the most beautiful the plant kingdom has to offer. Their amazing variation of geometrical design in growth and spine arrangement, at first bewildering, becomes finally the key to acquaintance with them, for one who is interested will soon learn that each species has its own peculiarities of structure.

To the natives of the regions where cacti are plentiful, the fruits of many species are an important article of food. Their wood, after the death of the plant, is used not only as fuel, but in building huts and fences as well as for furniture and many small tools. The long straight pieces from the columnar types are especially valuable for these latter purposes, and as is to be expected from the skeletal structure of such huge plants, the wood is strong and hard.

In the study of cacti it is of first and greatest importance to become acquainted with that cushion-like structure called an areole upon which the spines are clustered, for it is possessed by cacti alone. The areole has two centers or points of growth, the central or lower one producing the spines and new branches, the upper one producing only flowers.

While most persons are familiar with one kind of cactus or another, there is considerable popular confusion as to just what should be called a cactus. The word does not apply to any unusual-looking plant with thorns, spines, thick leaves, or fleshy stems. To be a cactus, a plant must first of all have the areoles mentioned above. Then, its flowers must follow a certain pattern. That is, the flower parts of a true cactus are always borne on top of the ovary, or fruiting portion; the sepals and petals are numerous rather than of a definite number, and they grade one into the other without a marked distinction between them. The stamens are also numerous (in certain of the Cereus tribe they are said to number as many as 2,000, but this quantity is not usual), and the style, or column which rises in the center, in a cactus has several branches at its tip. The fruit of a cactus is technically a one-celled berry, containing numerous seeds. It sometimes is dry, sometimes large and fleshy—much larger, in fact, than one expects a berry to become.

The cacti are divided into three main groups, the PERESKIA tribe, OPUNTIA tribe, and CEREUS tribe.*

Members of the Pereskia tribe, which contains only the one genus, *Pereskia,* are the cacti most similar to other plants because of their true leaves, stalked flowers, and slender almost woody stems and branches like those of an ordinary shrub. The edible fruits of *Pereskia aculeata* are known as Barbados gooseberries.

In five of the genera of the Opuntia tribe—*Pereskiopsis, Nopalea, Tacinga, Grusonia,* and *Opuntia* (the other four are so rare as to be almost unknown in cultivation)—the flowering center of the areole produces a mass of downwardly barbed bristles called glochids, the exact function of which is uncertain. The vegetative center, as with others, produces spines. In *Grusonia,* the glochids appear only with the flowers: in most of the others they arise out of the flowering center of the areoles whether the flowers develop there or not. Grusonias are further distinguished from Opuntias by the ribs on the segments of the stem.

Opuntia and *Nopalea* may always be recognized by their loosely jointed stem growths. In *Nopalea* (the cochineal-plant) and in one prominent group of *Opuntia*, these are flattened into plate-like structures called pads, often joined to each other at odd angles. Nopaleas may be distinguished from these opuntias only when in flower. Their petals, instead of spreading out, remain closed or erect, and the stamens extend beyond them. In another group of *Opuntia* the stem segments are cylindrical, but still without ribs. *Pereskiopsis* is considered related to *Opuntia* but it resembles *Pereskia,* having flat leaves which are persistent. Opuntias usually have true leaves on the young growth, but they are cylindrical or awl-shaped, mostly small, and short-lived, although in a few species they are 1 to 5 inches long and persist from six months to a year.

Opuntia is the largest genus in the Cactaceae, and is the only genus spread throughout the Americas. One of its species reaches the farthest north of any member of the family in North America and another the farthest south in South America. Opuntias of some species occur in all but three of the United States—Maine, New Hampshire and Vermont. They are so remarkably similar in general appearance as to be very difficult of classification, and a few of them in any living collection are sufficient to represent the genus. They may be divided into three sections: the flat-padded group or PLATYOPUNTIA, the cylindrical-stemmed group or CYLINDROPUNTIA, and the group called TEPHROCACTI, with ellipsoid, ovoid, or globular stem-segments.

The flat-padded group contains the greatest number of species. They

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* The classification presented here is not strictly in accordance with Britton & Rose and other authorities on the Cactaceae, but it has been somewhat simplified for the benefit of the amateur who is not yet familiar with all the structural details found in the family.

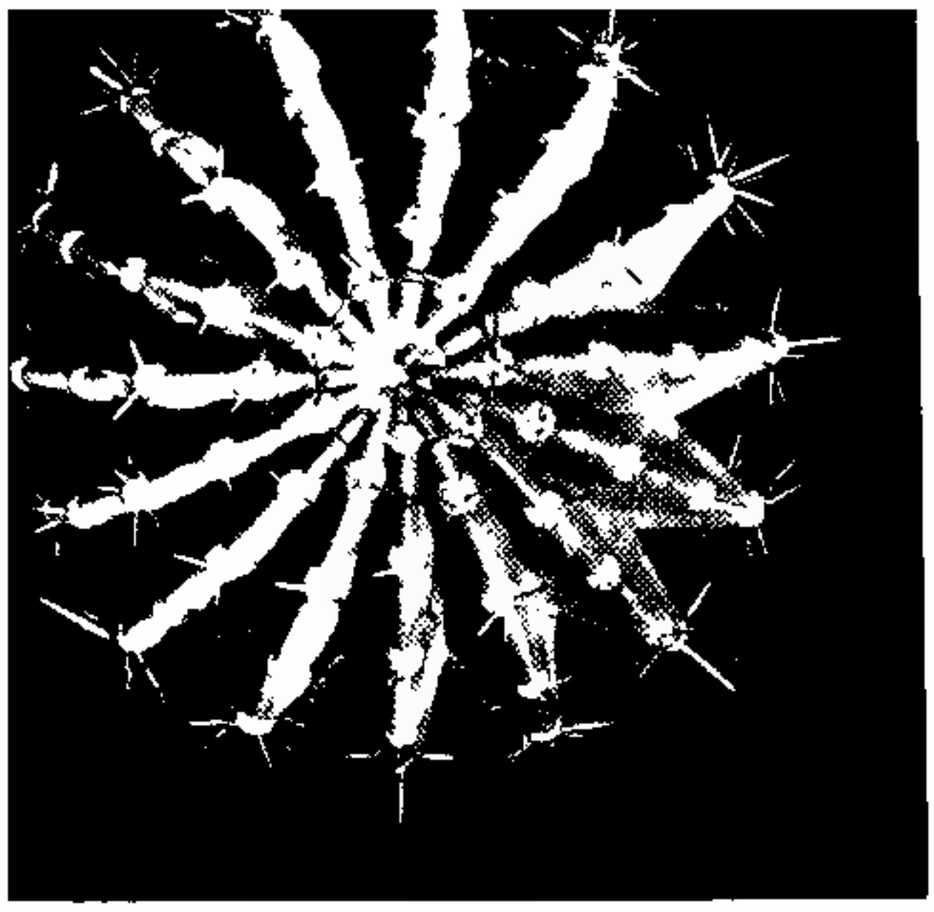
SPINE

PATTERNS

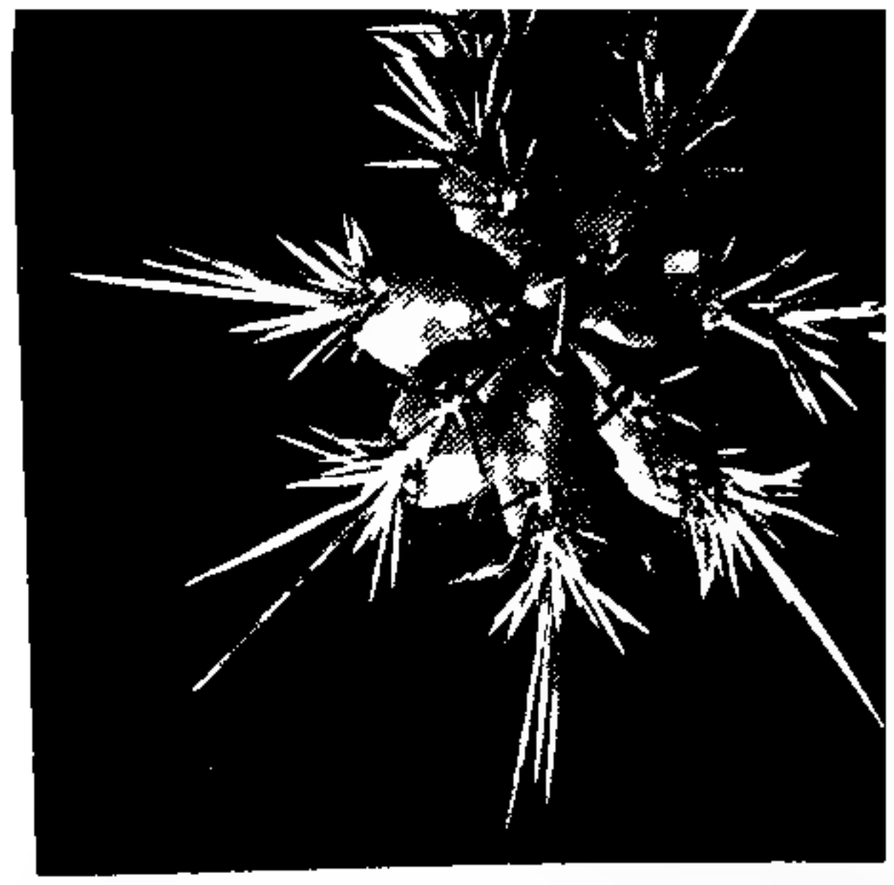
AND

CACTUS

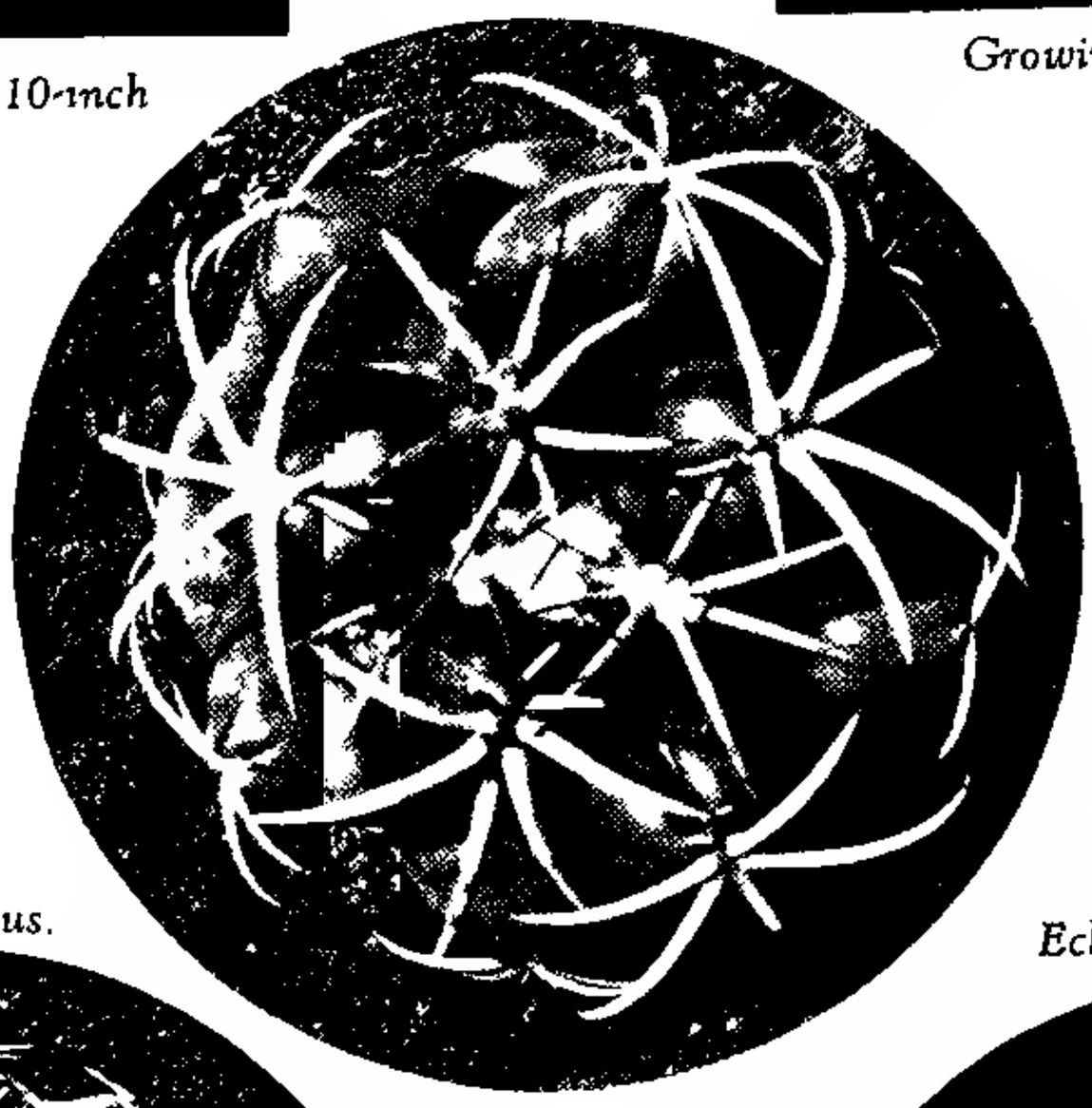
FLOWERS



Echinopsis Johnsonii, the 10-inch flower of which is shown on another page.



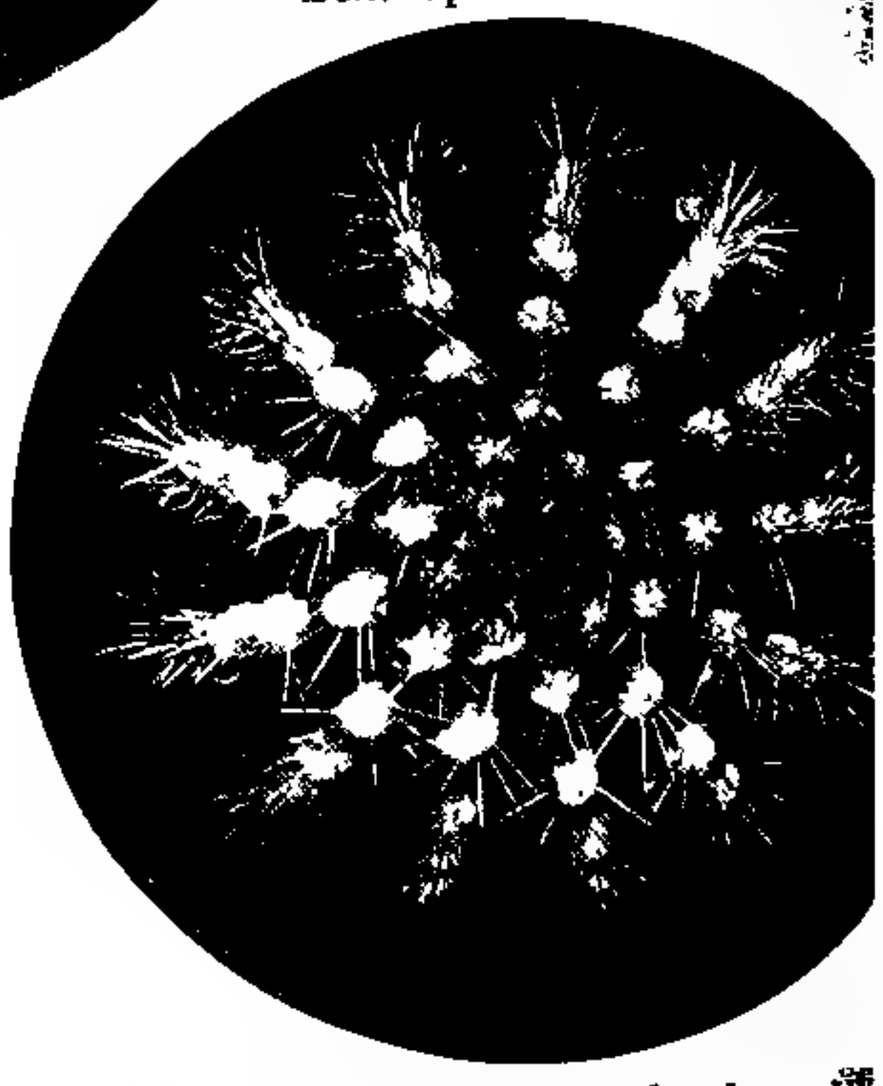
Growing tip of a Trichocereus.



Coryphantha elephantid showing the large, gro tubercles.

Echinocereus amoenus.

Echinopsis cordobensis.



Rebutia minuscula, easy to flower in cultivation.

The mescal button or peyote, Lophophora W

differ from one another in pad size, in having dry or fleshy fruits, and in ease of detachability of the pads, but principally in the arrangement and type of the spines. Some of the more outstanding ones are the grizzly-bear (*Opuntia erinacea*), the beaver-tail (*Opuntia basilaris*) with beautiful silken pink flowers, the cow's-tongue (*Opuntia linguiformis*), the beautiful blue-blade (*Opuntia santa-rita*), the Indian-fig (*Opuntia Ficus-Indica*), and the deceptively velvety-appearing rabbit-ear (*Opuntia microdasys*).

In the cylindrical-stemmed group are many kinds of cholla (pronounced *choya*), most wickedly armed of the family, all of them with easily detachable joints. These are shrubs of tree-like growth and furnish unusual features of the landscape in which they grow. They are the one group of cacti which instead of retreating before man, have defied him. They thrive on abuse and if too much disturbed, break into many pieces, each of which starts a new plant, much to the chagrin of their would-be destroyer. The spines are the most dangerous of all, painful and difficult to remove. They are the fortresses of the desert—animals sometimes become entangled among their branches and die; others such as snakes, lizards and birds find in them a safe refuge. Best known of them are the buckhorn (*Opuntia acanthocarpa*); the tree chollas (*Opuntia imbricata, O. versicolor, O. spinosior* and *O. tunicata*), all with silvery or yellowish, sheathed spines; the golden-spined teddy-bear, a beautiful plant, but too dangerous for familiarity; the jumping cholla, *Opuntia fulgida,* whose joints become detached from a mere touch and adhere to the passerby; the cane cholla, *Opuntia leptocaulis,* with slender branches and long spines; and that most dangerously repulsive of all, the devil-cactus or cursed cholla (*Opuntia Stanlyi*), a haven of safety for small animals, but otherwise an object of fear to man and beast. (*O. Stanlyi* is one of a group with club-shaped joints, considered as transitional between the Cylindropuntias and the Tephrocacti.)

Some Opuntias have been introduced into the Mediterranean region, South Africa and Australia. They have made themselves too thoroughly at home and have become such a menace that their importation is now forbidden in the two latter regions, and government botanists are seeking fungus diseases and insects which may destroy them. The Opuntia is the usual type of cactus which appears in many photographs made in the Holy Land. The presence of several species there now has led many artists to place them in Biblical paintings and drawings. They are, however, of recent introduction, since cacti were unknown in the Old World until after the discovery of America, and hence could not have been present in Biblical times.

The Tephrocacti, all of which are native to western South America, are very difficult to keep in cultivation unless grafted upon some more easily grown cactus. They are rather compact plants with short stem segments,

and usually form large clustering growths. The two best known are the woolly vegetable-sheep of the Andes (*Opuntia floccosa*), and the paper-cactus (*Opuntia glomerata*), with spines flattened into harmless but firm, paper-like structures.

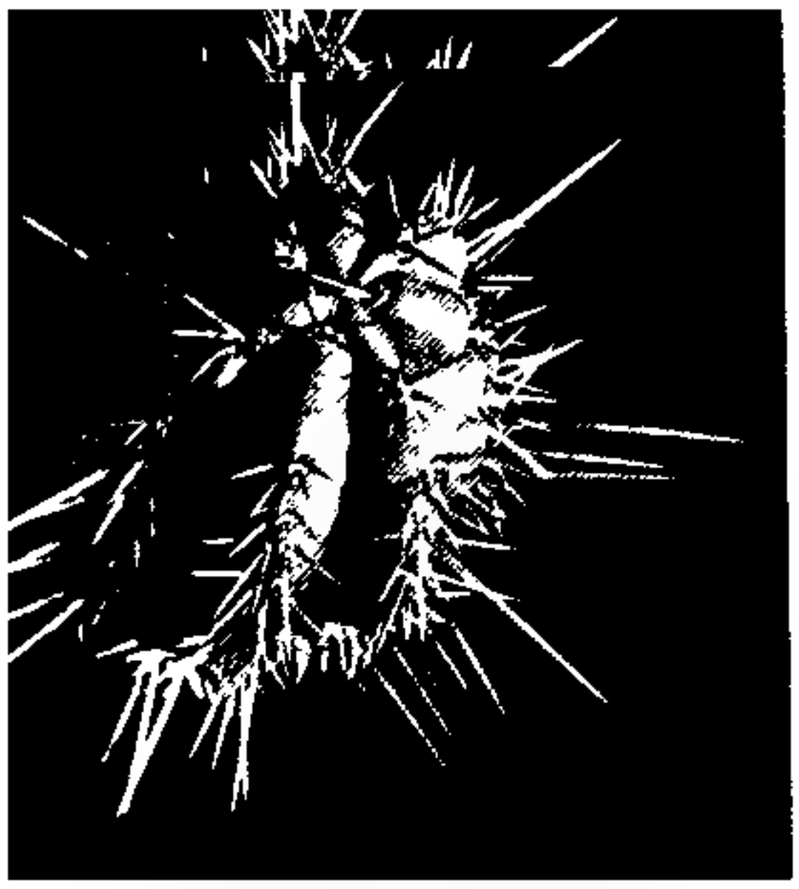
Members of the Cereus tribe may always be known by their ribbed stems of continuous growth, columnar, melon-shaped, barrel-shaped or globular, their areoles never with glochids, and their stems when jointed not easily detached. They are subdivided into numerous genera, each recognized by some peculiarity of floral, fruit, or vegetative structure. These may be placed in four major groups. If the flowers and spines arise from the same areoles we have either the CEREAE or the ECHINOCACTAE. When the stems are long-jointed and columnar we have the CEREAE; when short-jointed and melon- or barrel-shaped we have the ECHINOCACTAE. If the flowers and spines arise from different areoles we have the CACTAE. If the areoles are spineless or mostly so, we have the epiphytic or jungle group, best called EPIPHYLLAE.

The Epiphyllae do not inhabit the desert but generally grow on trees, frequently in dense forests. Some of them possess the smallest, others some of the largest and most fragrant flowers in the family. They are not treated further here as we are concerned with the desert types only.

It is not considered necessary for present purposes to go fully into the further subdivisions of these major groups, but some of the more characteristic, well known and popular ones are here presented with typical examples of each.

The Cereae contain the most massive and spectacular growth-forms in the family, best known of which is the giant sahuaro (*Carnegiea gigantea*) of the Arizona and Sonora deserts, a branching type growing 50 feet tall and weighing tons. Within the group are also the organ-pipes (*Pachycereus marginatus*, *Lemaireocereus Thurberi*, and others) which branch mostly from or near the base into great clusters of fluted columns. Here also are the candelabra types (*Pachycereus*, *Lemaireocereus*, *Cephalocereus*, *Cereus*, *Escontria*, *Myrtillocactus* and others) which branch from the stem and form heavy tree-like growths with closely packed columnar branches—the most massive plants in the cactus world, rivaling the sahuaro (or suhuaro) in height and surpassing it in overall weight. Here too we find the popular "old man" (*Cephalocereus senilis*) with long coarse white "hair" instead of spines, and the "old men of the mountains" (*Orcocereus*) with thinner white hair intermingled with spines; the famous creeping-devil (*Machaerocereus eruca*) of Lower California, like a gigantic, spiny caterpillar, which always heads toward the sea; the fantastic chain-column cereus (*Jasminocereus galapagensis*) of the Galapagos Islands; the sun-cereus (*Heliocereus*) with its brilliant red or scarlet flowers whose blood infused into the hybrid epiphyllums has produced so many beautifully colored blossoms; the torch-cacti (*Tricho-*

ODDS AND ENDS AMONG THE CACTI

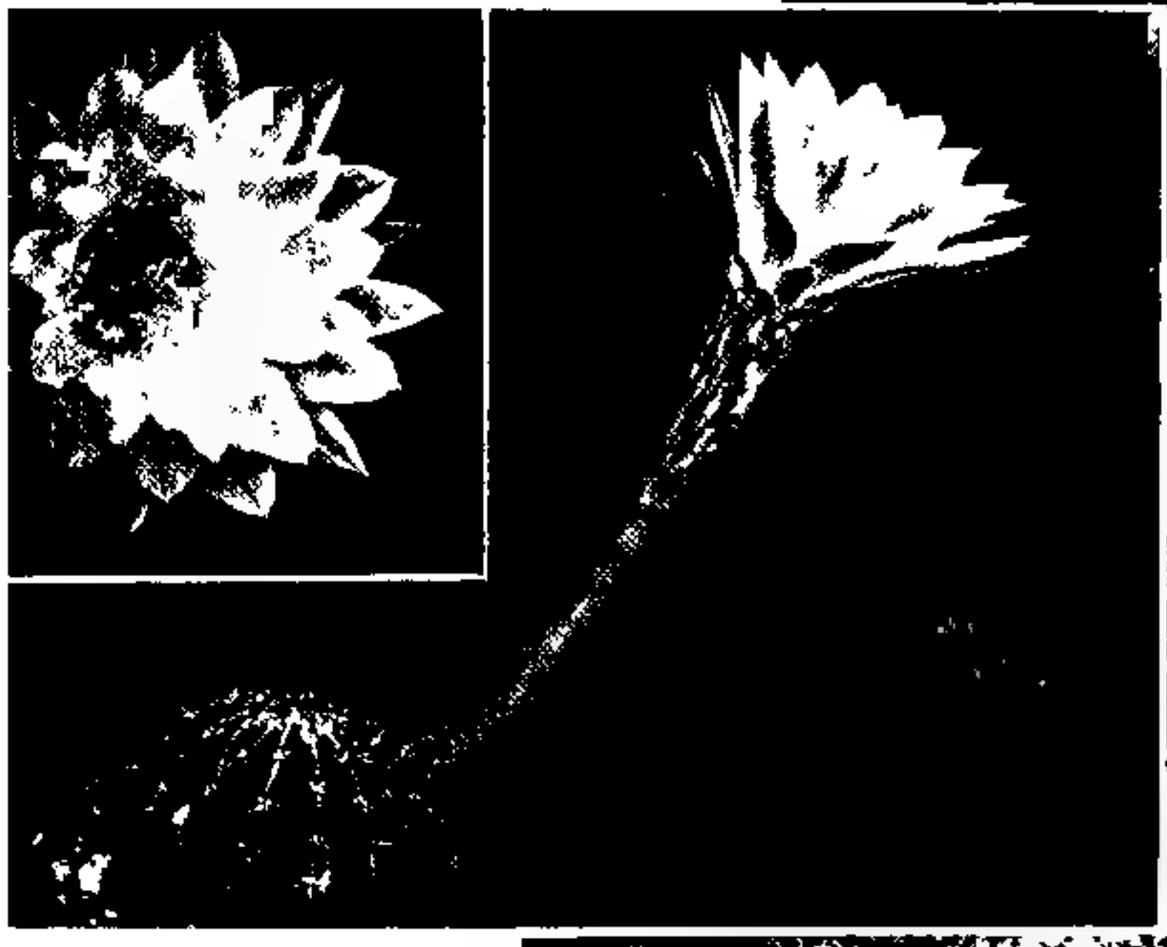


A Trichocereus from the Andes.

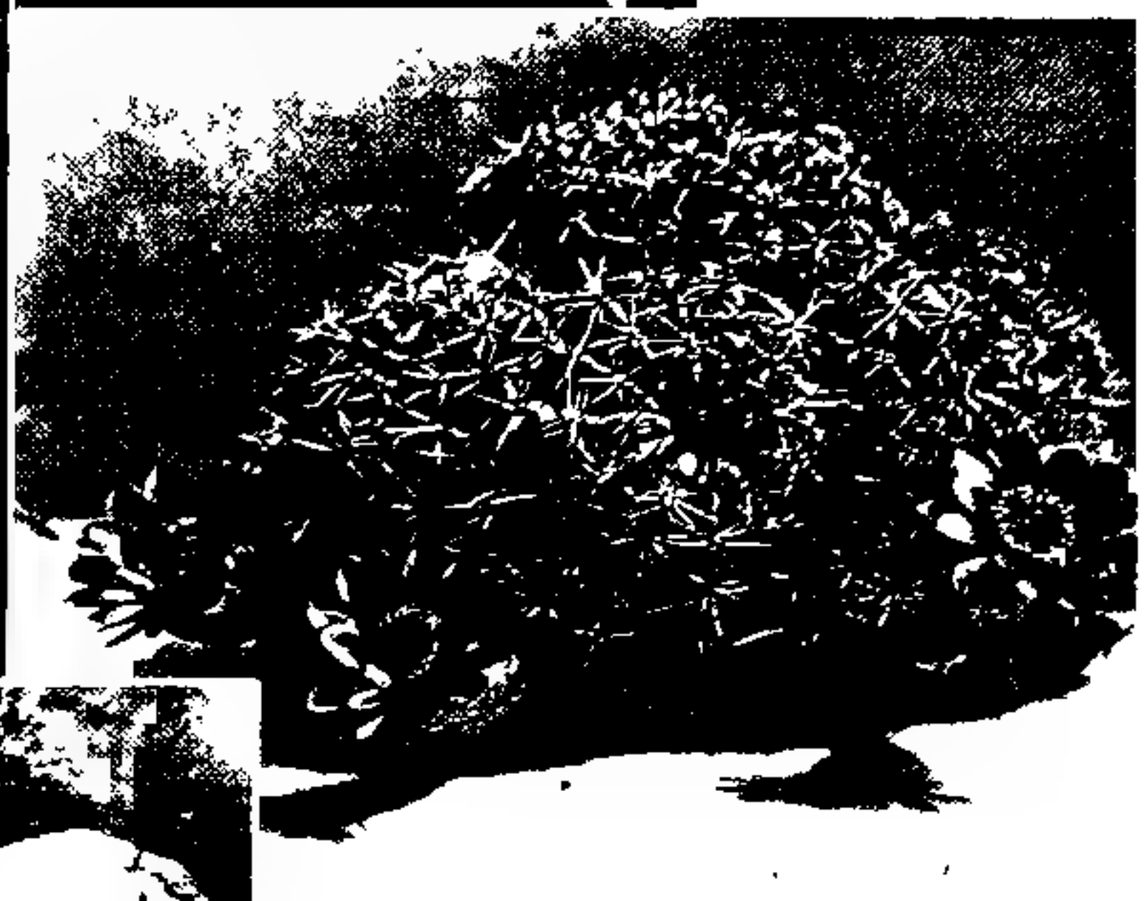
Cereus Hildmannia blooming in early morning.

The living-rock, Roseocactus fissuratus.

Pereskia aculeata, whose fruits are known as Barbados gooseberr



Flaming red flower Lobivia andalgalen



Echinopsis Johnsonii, sometimes called the Easter-lily cactus.

A challenge to the grower, Pelecyphora Valdeziana rewards with large cerise-purple flowers.

cereus) of South America with blooms like snowy white chalices; the weird monstrosities known as totem-poles (*Cereus* and *Lophocereus*), freakish growths of several different kinds; lastly, most popular of all, the serpent-cereus (*Nyctocereus serpentinus*) of Mexico, one of the most widely cultivated of all cacti, whose flowers are said to bloom all on the same single night no matter in what part of the world they are growing.

Closely related and differing principally in their climbing growth, aerial roots and densely scaly or hairy flower tubes are some of the other night-blooming cerei (*Hylocereus* and *Selenicereus*), any of which may be called Queen-of-the-night. Their flowers, up to 15 inches long, are the largest in the Cactus family and are deliciously fragrant. As with other night-blooming flowers, most of them are white, but two red ones are known.

Seemingly out of place in this group are the rat-tail cacti (*Aporocactus*), natives of Mexico, with long, flexible, whip-like, bristly stems and pink or purplish flowers.

The Echinocactae contain two groups markedly different in the placement of the flowers, which in one group are terminal on the plant body and in the other group lateral or basal. The lateral-flowering group has within its bounds some of the most beautiful flowers in the family. Here belong the hedgehog cacti (*Echinocereus*), of the North American desert areas. They are many in number, varying from the rainbow-cactus (*Echinocereus rigidissimus*) with colored rings of spines, so difficult to keep in cultivation, to the more easily grown lace-cactus (*Echinocereus Reichenbachii*) and the strawberry-cacti, with all their red, pink, purple and yellow-flowering relatives and a few green- and white-flowered ones thrown in for good measure. The South American hedgehogs or cob-cacti (*Lobivia*) are the most beautiful-flowered of all cacti and run the greatest color-scale. Their brilliancy is unrivaled and, coupled with their satiny and silky textures, makes them when in flower one of the most glorious sights in the plant world. They are scarce in cultivation, but the future bids fair to increase their popularity, though they are difficult to flower under glass. Somewhat similar in form and flowering habit are the Easter-lily cacti (*Echinopsis*), with white or pink flowers eight to ten inches long. They are easily flowered in cultivation, and as a result, justly popular. The crown-cacti (*Rebutia*) are the tiniest of this group, and the only ones with nipples instead of ribs; their flowers are borne in a circle around or near the base of the plant and are surprisingly numerous for so small a plant-body.

Those in the terminal-flowering group are more spectacular as to plant form and spine arrangement. Here belong the great water-barrels (*Ferocactus*) of the American desert, the beautiful golden barrel of Mexico (*Echinocactus Grusonii*), the golden and silver balls (*Notocactus*) of southern South America, the interesting brain-cacti (*Stenocactus*) of Mexico, and the terrible manco caballo or horse-crippler (*Homalocephala*

texensis) of Texas with its beautiful fringed and frilled flowers the color of strawberry ice-cream, set as if in defiance to its wicked armature. Also within the bounds of this relationship are some of the great rarities as well as the least cactus-like members of the family, and the most difficult subjects to grow in cultivation. Here are the living-rocks (*Ariocarpus* and *Roscocactus*) of Texas and Mexico, the alpine barrels (*Oroya* and *Matucana*) of the Andes, the sea-urchin (*Astrophytum Asterias*) and the bishop's-cap (*Astrophytum myriostigma*), the pineapples and pine-cones (*Ariocarpus, Roscocactus, Encephalocarpus* and *Obregonia*) of Mexico, the agave-cactus (*Leuchtenbergia principis*), the little golf-ball (*Epithelantha micromeris*), the rare and difficult Aztec cactus (*Aztekium Ritteri*), which resembles a piece of Aztec sculpture, and lastly the mescal-button or peyote (*Lophophora Williamsii*), the only poisonous member of the family, the use of which is forbidden by federal law because of its narcotic effect.

The last group, the Cactae, the most typically cactus-like, and the group from which the family derives its name, has few genera, but many species. There are two divisions here, based on flower position. The larger group, the MAMMILLARIAE, have the flowers arising from between or upon the young nipple-like protuberances upon which the spine-areoles are borne. In the genus *Coryphantha* the nipples are grooved on the upper side and from these grooves in their young state the flowers are borne. These flowers are mostly large and showy, the colors rather inclined to paleness, but still beautiful by reason of their silky texture. The genus *Thelocactus* is very similar to *Coryphantha*. The flowers are larger and more beautifully colored and the ovary is scaly, whereas in *Coryphantha* the ovary is naked. The genus *Mammillaria*,† second largest in the family, is, except for one species, confined to North America, and there mostly in Mexico. About half of the species of this genus have milky juice, the only cacti so constituted. Their flowers are borne between the nipples, which in this genus are not grooved. The plants are all small and many kinds are easily grown in a small space. Their popularity is attested to by the common names of some of the various kinds or groups such as pin-cushion, fish-hook, dumpling, biscuit, thimble, lady-finger, powder-puff, cotton ball, and old lady, each of which is justly in favor for some individual sort of beauty or interest.

Last in the family are the true cacti, the two genera *Melocactus* and *Discocactus*, the most highly specialized of all. Their flowering areoles are condensed into a terminal head-like mass called a cephalium, out of which the flowers arise. In *Discocactus*, the flowers are nocturnal, large and many-petaled; in the genus *Melocactus*, they are small and few-petaled. These are the Turk's-cap and melon cacti of the West Indies and South

† The photograph of a Mammillaria on page 37 is of *M. phymatothele*, according to Britton & Rose in "The Cactaceae," where it originally appeared.

America. They are not common in cultivation, *Discocactus* scarcely at all, but they always attract attention by reason of the red or brown fez or turban which is the cephalium, looking as though it had been grafted onto the plant.

Such are the cacti, those unique children of the desert who claim the rocky wastelands of the Americas as their home. That they can adapt themselves elsewhere is evidenced by their great and increasing popularity as horticultural subjects. True, but a small number of them are winter-hardy in northern climates, but for those who have the facilities for their cultivation under glass, as well as the infinite patience and horticultural skill necessary to make the more difficult ones feel at home, they will reward them with a message from the desert, clothed in the beauty of silken and satin flowers, enhanced with the charm of geometrical symmetry and solidity. Grow them, become acquainted with their wants and learn their names. There will be disappointments, for some will not survive, but be satisfied with those that will, and if the need is felt, go and admire the patience, skill and technique that has built up the large collections.

Significance Of A Herbarium *

By William J. Robbins

A HERBARIUM, as has been emphasized by other speakers on this program, is essential for the knowledge of plants and their use, because without authentic information as to the kind of plant with which we deal our knowledge is of little use except for the moment. Printed descriptions, such as are found in manuals, keys, illustrated floras and similar publications, are but poor substitutes for the carefully identified and annotated specimens in the herbarium. This makes a herbarium, which is of the size and quality of that of The New York Botanical Garden and which represents the flora of the world, almost priceless, because it is a depository of knowledge in much the same way as a great library.

However, the value of such a collection of plants as is found in the herbarium of the New York Botanical Garden does not consist merely in having the two million specimens which are there. They are of little value if they are not used, and their use depends upon the herbarium being suitably arranged and cared for. This duty is the direct responsibility of the Custodian of the Herbarium, Mr. G. L. Wittrock, and his assistants.

A world herbarium, such as that of the New York Botanical Garden, is continually growing. Forty thousand specimens or more are added each year, and these must be properly mounted or boxed and labeled. This is the duty of Miss Margaret Wheeler, who has charge of the mounting room for the phanerogams, and of Miss Rosalie Weikert, who cares for the cryptogamic herbarium. But no matter how well arranged or how carefully mounted the herbarium material may be, its value is determined largely by how it is used.

Dr. Gleason as Head Curator of the herbarium and Dr. Seaver, whose main concern is the cryptogamic herbarium, bear the responsibility not only for the preservation and extension of the her-

* See footnote on page 39.

barium, but for its use. Thousands of inquiries are received annually which are answered on information which is derived from the herbarium. But that is not enough. There are many problems still unanswered in the naming, classification, and relationships of plants; there are large areas of the world which are still unknown botanically, all of which means that large gaps still exist in our knowledge of the taxonomy of plants. A herbarium should and must serve as a means for adding new knowledge to the old that we have about plants. The taxonomic staff of the New York Botanical Garden, as has been indicated by earlier speakers, has met this obligation in the past and is continuing to do so at the present time.

Dr. Gleason is and has been for several years recognized as a world authority on the Melastome Family. This large family has about 800 species in tropical North America and nearly 3,000 in South America. It is noted for its numerous members with beautiful flowers, and several species are grown in our greenhouses. Duplicates of Melastomes collected are sent here for identification, and we have the finest representation of this family in America.

Dr. Seaver is known for his work on that beautiful and interesting group of fungi, the Discomycetes or cup-fungi. He has published a monograph on this subject and is continuing his researches in this group and others.

Dr. Camp is engaged in a revision of the North American blueberries in cooperation with cytological and breeding work done by the United States Department of Agriculture. The blueberry crop is now a $5,000,000 industry in this country and nearly all State and Federal agencies send their material here for study and identification. As a specialist in the Ericales, Dr. Camp is called upon for assistance with many of the larger and more complicated genera of this group. This has resulted in recasting various species. Most recently, as the result of the collection of unusual specimens in Tennessee, he has been engaged in a complete revision of the beeches which has led him to a consideration not only of those species which exist now, but the fossil forms as well.

Dr. Moldenke is recognized as a world authority on the Verbenaceae. He is engaged in monographing the vervain and black-mangrove families for North American Flora, and he is also co-operating in the preparation of a Flora of Panama, a Flora of Surinam, a Flora of Texas, a Flora of Yucatan, and the Flora Brasilica. In addition, he is continuing work on a monograph of the Verbenaceae of the world—Europe, Asia, Africa, Australia, and America. This family has 80 genera and 3,000 or more species and includes many valuable medicinal, economic, and horticultural plants. Dr. Moldenke is co-operating with Mr. Krukoff on the South American arrow-poison plants which have assumed prominence recently in medical practice.

Mr. Alexander is investigating the general floristics of the flora of the Southern United States and is making a special study of the Cactaceae, Crassulaceae, Mesembryanthemums, and other succulents with special reference to the living collections at the New York Botanical Garden.

Mr. Krukoff, Honorary Curator, devotes his research time to the study of various plants important in medicine. He has published recently on the genus *Erythrina*, a group of plants which yields several alkaloids of importance in medicine, and is now working on plants which yield strychnine.

Mr. Hagelstein and Mr. Burke, Honorary Curators, are engaged in the study of those interesting groups of beautiful microscopic plants, the slime-molds and the diatoms.

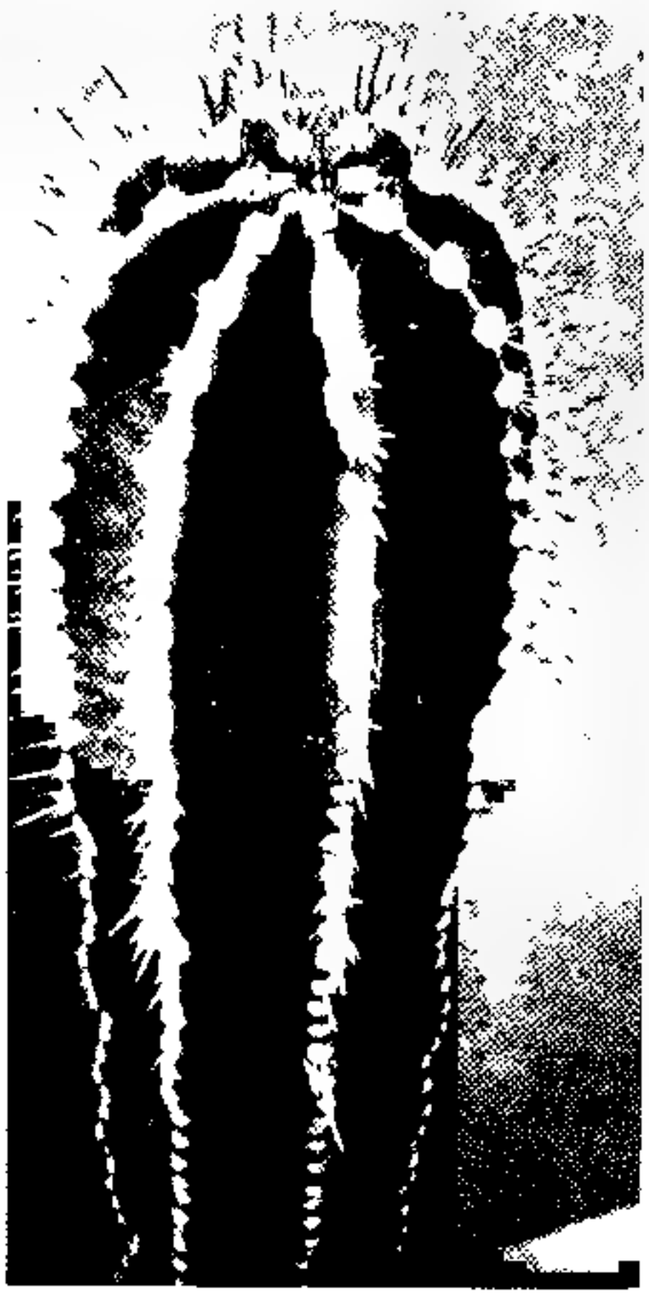
Mr. Gilly, although employed as an artist, is making studies of the sedges.

Señor Carabia, of Havana, Cuba, is spending a year at the Garden on a Guggenheim fellowship, preparing material for a Flora of Cuba.

Mr. Dwyer, a graduate student, is writing a doctorate thesis on the American species of the family Ochnaceae.

In addition, the herbarium is used by many botanists who spend from a day to several months studying the collections which are available here. When we consider therefore the way in which the herbarium of the New York Botanical Garden serves as a basis for distributing to the public authentic information on plants and the way in which our herbarium forms the foundation for continuing important researches in the field of taxonomy, I think that we can say that it is one of the most important and valuable possessions of the New York Botanical Garden.

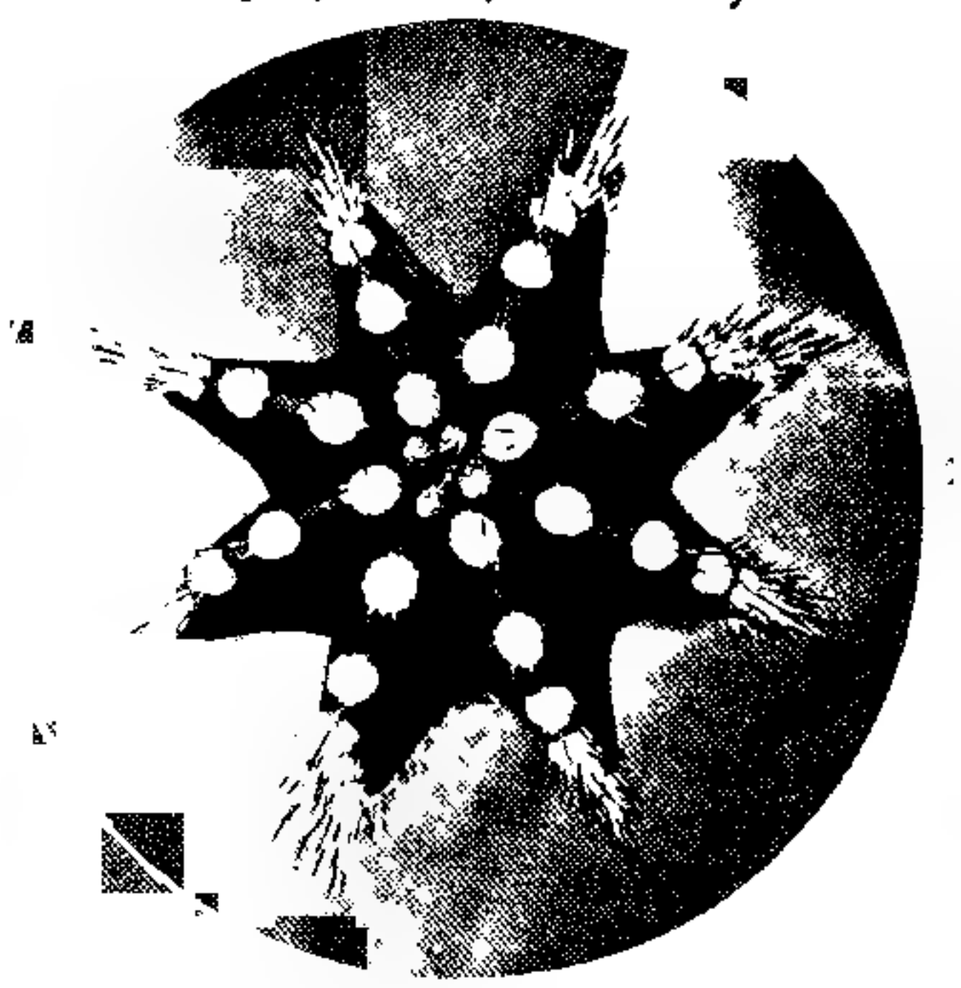
CACTUS FORMS AND FLOWERS FROM ROCKY DESERT LANDS



Cephalocereus euphorbioides.

Echinocereus subinermis.

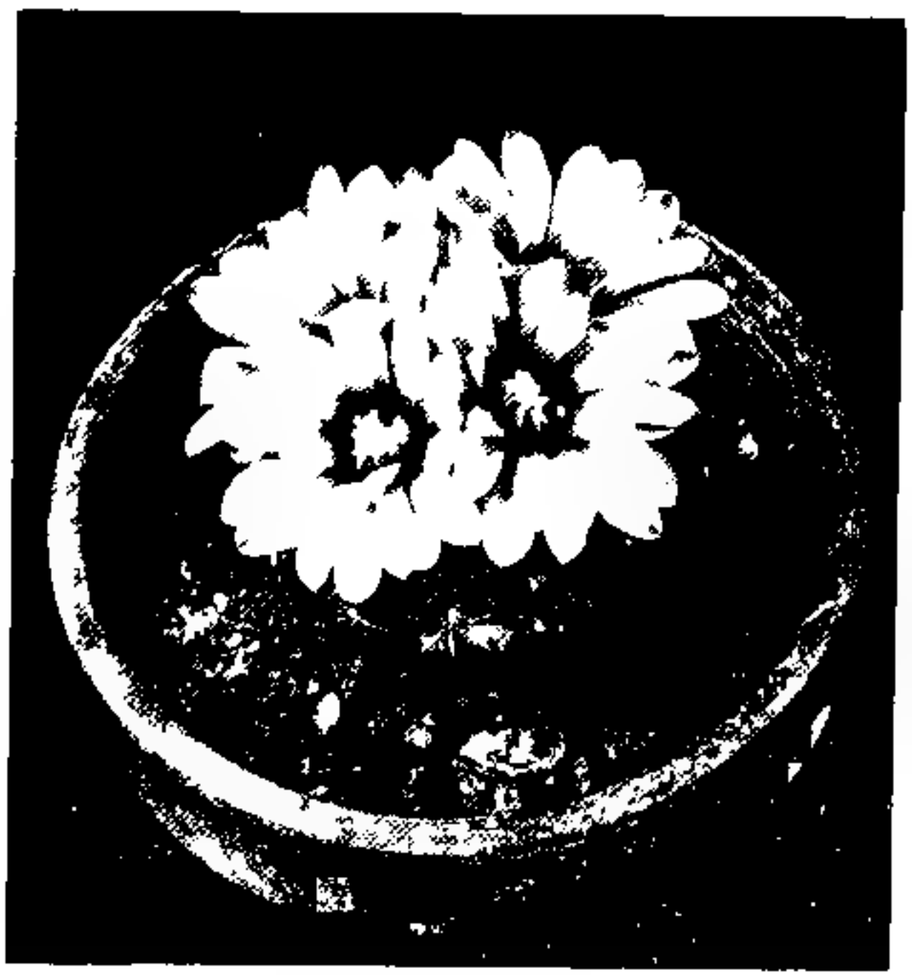
Top of the 3-foot stem of



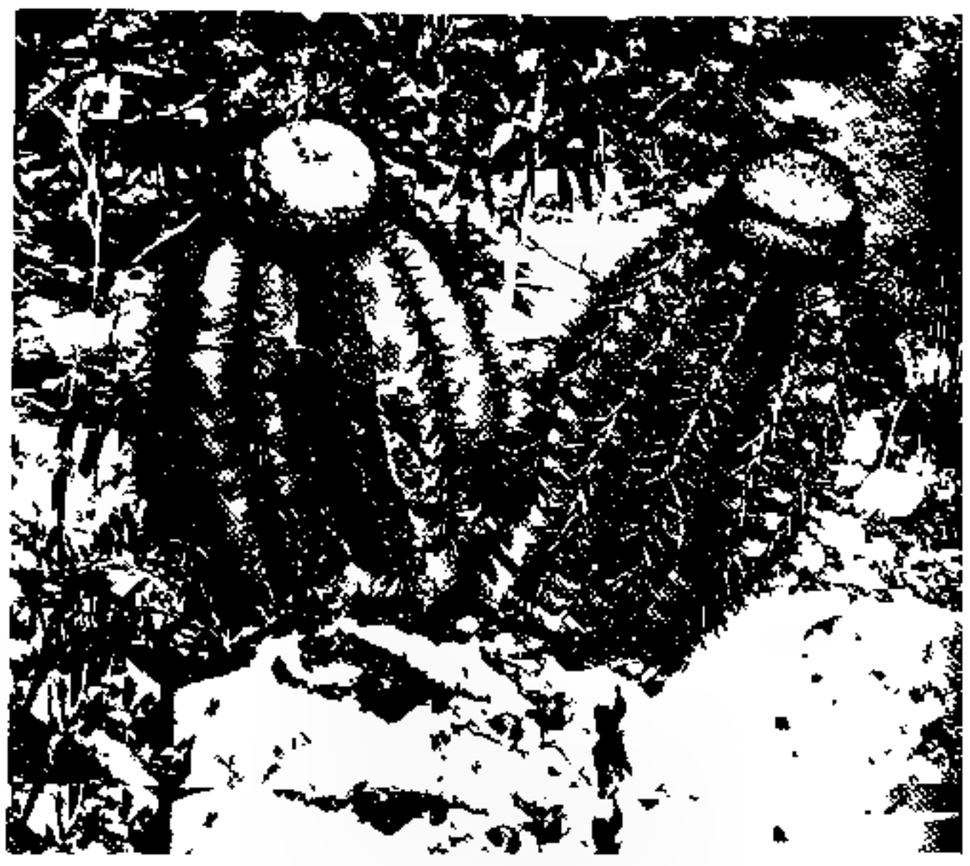
Cephalocereus euphorbioides.

Astrophytum Asterias, the sea-urchin.

Gymnocalycium Quehlianum, easy to flower in cultivation.



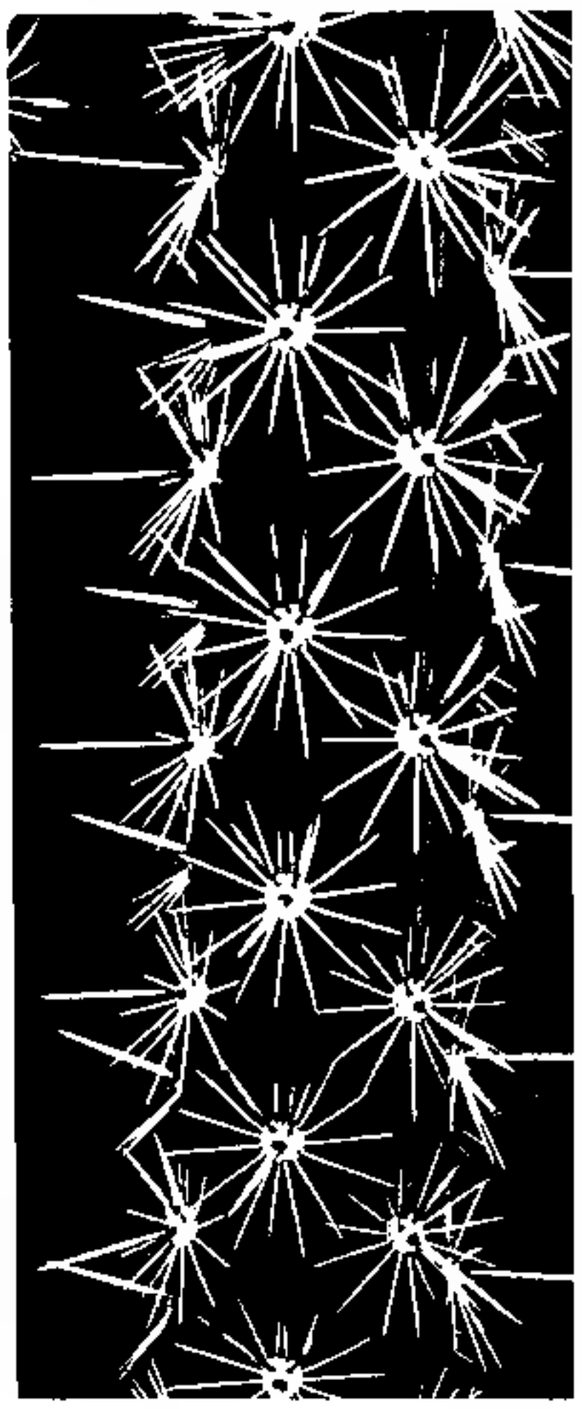
The Turk's-cap, Melocactus intortus.



· *rainbow cactus, Echinocereus rigidissimus.*

Mammillaria

Encephalocarpus strobiliformis.



Rathbunia alamosensis.

Pelecyphora aselliformis,
a rare and unique species.

Mammillaria Heyderi.

Echinocereus enneacanthus.

Notocactus mammulosus, flowers readily.

Important Collections In The Herbarium

By H. N. Moldenke

A RECENT SURVEY reveals that our herbarium contains over 2,800 different collections, that is, material assembled by more than 2,800 botanists and botanical collectors. Among these are some collections which are of extremely great value and importance. Time permits of only a very few of these being mentioned here. Most noteworthy is the Columbia University herbarium deposited here on what amounts to permanent loan. The Columbia University herbarium was begun early in the last century by Dr. John Torrey and contains the material upon which his botanical writings, extending over half a century, were based. To this nucleus Mr. John J. Crooke added two very valuable collections—that of Professor C. J. Meisner of Basle, Switzerland, and that of Dr. A. W. Chapman of Apalachicola, Florida. The Chapman herbarium contains the basic material on which his important work on the flora of the Southeastern United States was done. A few years later the mosses, and many of the hepatics and lichens, accumulated by Mr. C. F. Austin, were incorporated in the Columbia University herbarium, followed by the famous collection of mosses brought together from all parts of the world by Dr. J. G. Jaeger of Switzerland and the 20,000 specimens collected by Thomas Morong in Paraguay, Chile, and elsewhere. To this Dr. Torrey's successor, Dr. N. L. Britton, while professor at Columbia University, and his associates, added continuously by securing collections from all parts of the globe and by special collecting trips to various parts of North and South America, including some 6,000 specimens collected by the late Dr. H. H. Rusby in the Andes of Bolivia and elsewhere.

Another of the most important herbaria here is that of J. B. Ellis, containing some 85,000 specimens of fungi. This herbarium was the largest collection of fungi in America at the time that it came to us and one of the largest in existence anywhere. Dr. Ellis is said to have described more species of fungi than all other American botanists together, and the original material of these descriptions is now in our possession

Of great significance is the Otto Kuntze herbarium, containing some 32,000 specimens, presented to us by Mr. Andrew Carnegie. Dr. Kuntze was a world traveler and a prodigious writer on the plants of every part of the world. All the original material on which his writings are based is incorporated in this herbarium.

The New York Botanical Garden herbarium has without doubt the largest and finest collection of West Indian plants extant. We have material here of almost all the important West Indian collectors, Wright, Ricksecker, Combs, Broadway, Millspaugh, Ekman, Valeur, Sintenis, Harris, most of the contemporaneous Cuban, Puerto Rican, and other West Indian collectors, and many others. Dr. N. L. Britton, on his repeated trips to the West Indies with various associates, himself added over 138,000 specimens from that region. Through the generosity of Mr. Cornelius Vanderbilt we secured Heller's 7,800 specimens from Puerto Rico.

Another region for which our collection is the finest and most important in the world is that of the Southeastern and Southern United States. We have here the A. W. Chapman herbarium on which his "Flora of the Southern United States" was based; the F. S. Earle collection of some 10,000 specimens, including several thousand fungi and a nearly complete representation of the flora of Alabama made by him on the Alabama Biological Survey; and the 3,000 specimens collected by S. M. Tracy, which form the most important collection ever made in Mississippi and some adjacent territories. We also have the Lighthipe, Garber, Curtis, Simpson, Rugel, and Huger plants of Florida; Pollard plants of Mississippi; Biltmore plants of North Carolina; Benjamin F. Bush plants of Missouri and Oklahoma; Ruth and Heller plants of Texas and Arizona; R. M. Harper plants of Georgia; and the famous Elihu Hall plants of Texas, said to be one of the most important collections ever made in that state. To these as a nucleus, the late Dr. J. K. Small on his repeated exploratory trips through the South added

over 70,000 specimens of his own collecting.

Not to be forgotten is the region of the Rocky Mountains and of the plains and prairies in central North America. From this area the late P. A. Rydberg himself added some 35,000 specimens to our herbarium, including 15,000 alone from Montana and the Yellowstone region. These, added to such basic collections as those of Hitchcock from Kansas; Sandberg, McDougal, and Heller from Idaho; Wooton from New Mexico; Elmer and Lloyd from the Northwest; Frank Tweedy from Wyoming and the Rocky Mountains; and the historic United States Government and railroad exploring expeditions and boundary surveys, make our herbarium of outstanding importance to any study of the flora of that vast portion of the continent.

Noteworthy also is the Vigener herbarium of over 10,800 sheets, presented to us by Mr. Andrew Carnegie. This is very rich in rare Mexican specimens, including 4,500 of the collections of Schaffner, and in plants of northern and central Europe, including a valuable series of seaweeds, lichens, and fungi. In this building are now the R. S. Williams plants of the Yukon, said to be the first collection of plants ever made in the Klondike area, and some 20,000 specimens of his collection from the Philippines, Panama, Bolivia, and Peru, including hundreds of species never before known to science.

Another of the most important collections in our herbarium is that of Dr Henry, who assembled what is generally admitted to be the most valuable collection ever brought out of Formosa and China, filled with specimens of plants hitherto unknown to science. We have some 8,000 specimens of his collections—only the Royal Botanic Gardens at Kew has a larger set.

In our herbarium is now incorporated the famous collection of Characeae or stoneworts, assembled by Dr. T. F. Allen Some 8,000 of these seaweed-relatives are in the collection –unquestionably the finest assemblage of these plants ever made. Here also are some 8,000 of John Macoun's famous Canadian, Arctic, and Selkirk plants. This tireless collector is said to have covered more of Canada, including the subarctic tundras, than any other man, and has brought back plants from places where no white man ever was before. In our herbarium are the 12,000 plants of Nova Scotia and Newfoundland, collected by Howe and Lang.

Few, if any, institutions can equal ours in the amount of South American material preserved in their herbaria. Here, besides the already-mentioned collections of Rusby, Williams, and Morong, are the Bolivian collections of Bang, Cardenas, White, and Buchtien; Argentine plants of Kurz, Cabrera, Descole, Schulz, Parodi, and Kuntze; Patagonian plants of Moreno and Tonini; Paraguayan plants of Autran, Fiebrig, and Hassler; Chilean plants of Gay, Werdermann, Skottsberg, and Hollermayer; Peruvian plants of Killip, Smith, and Klug; Guianan plants of Jenman, Gleason, and De la Cruz; Venezuelan collections of Pittier, Williams, Rusby, and Squires; Colombian collections of Pennell, Killip, Hazen, Lawrance, Lehmann, and H. H. Smith; and Brazilian plants from a host of collectors. In recent years the expeditions of B. A. Krukoff to Brazilian Amazonia and Bolivia have enriched our herbarium by thousands of valuable specimens. From each of his trips to this area Mr. Krukoff returns with hosts of plants never before known to science, some of them of tremendous medicinal and economic value. A few years ago we secured from Cambridge University a splendid set of South American collections of the famous Richard Spruce, pioneer explorer and botanist in many remote parts of the continent. Here also are the famous collections from Mount Duida, in Venezuela, site of "The Lost World."

And so I could continue in an almost endless enumeration of the important collections now incorporated in our herbarium, but time does not permit, and I think that the few which I have mentioned will serve to illustrate the point.

The above address, also the one beginning on page 34, was given at the Botanical Garden Dec. 11 when the 2,000,000th specimen was incorporated into the herbarium. The opening speech appeared in last month's Journal. The remainder will be printed in future numbers.

Color Patterns In Daylilies

By A. B. Stout

THE NUMBER of the distinctive pigments, their quality or nature, and their distribution in the face of the open flower are the main features of significance in defining the classes of color patterns in the flowers of daylilies.

There are two principal classes of pigments in the tissues of the flowers of daylilies: (1) the plastid pigments which give the green, the yellow and the orange color effects and (2) the sap pigments or anthocyanins which are some shade of red. The plastid pigments are chiefly sub-epidermal and hence mostly confined to the inner tissues; the sap colors are most strongly developed in the outer or epidermal layer of cells. Thus the effect in any area of the face of the flower may involve only one of the two kinds of pigments or be the combined effect of one over the other. There are many gradations in color values from green to yellow and orange and in the shades or tones of yellow and of orange. For the red-colored pigment there is also much diversity in shade and intensity.

For the following outline of color patterns there has been consideration of the species of *Hemerocallis*, the large number of named horticultural clones, and the numerous hybrid seedlings that have been grown at the New York Botanical Garden.

When there is more than one distinct shade of pigmentation the tendency is for the distribution to be either concentric or radial. One of these distributions may dominate in a pattern but both may be strongly in evidence in the same flower.

At the present time the writer does not wish to apply single names to each and every one of the patterns noted in the following scheme. Here the descriptive terms which apply to a pattern are the several names given for the main class, the sub-divisions, the individual pattern and the sub-pattern. For example, the pattern of Fig. 7 is concentric, two-toned, banded, and radiate. There are, of course, intergradations between various of the 15 patterns here described and illustrated.

I. SELF-PATTERN. The entire face of the flower is of one color.

One-toned; Fig. 1. The one-toned pattern is usually some shade of yellow or orange and hence the pigments are plastid in origin. Frequently the extreme throat is somewhat green, but when this becomes distinct in contrast to either yellow or orange in the outer part of the perianth the pattern becomes concentric.

II. CONCENTRIC PATTERNS may be arranged into four groups and these further divided into at least 9 different pattern types or individual patterns.

A. *Semi two-toned.* The distribution of one pigment or the combination of two pigments is such that there is a gradual but rather uniformly concentric change in the intensity of one dominant color.

Centric; Fig. 2. In this the shade of coloring is most intense in the extreme throat of the flower. Certain seedlings have this pattern in a coloring dominated by the sap pigments. This particular pattern is new and unusual for *Hemerocallis*.

Distal; Fig. 3. In this pattern the shade of color becomes more intense toward

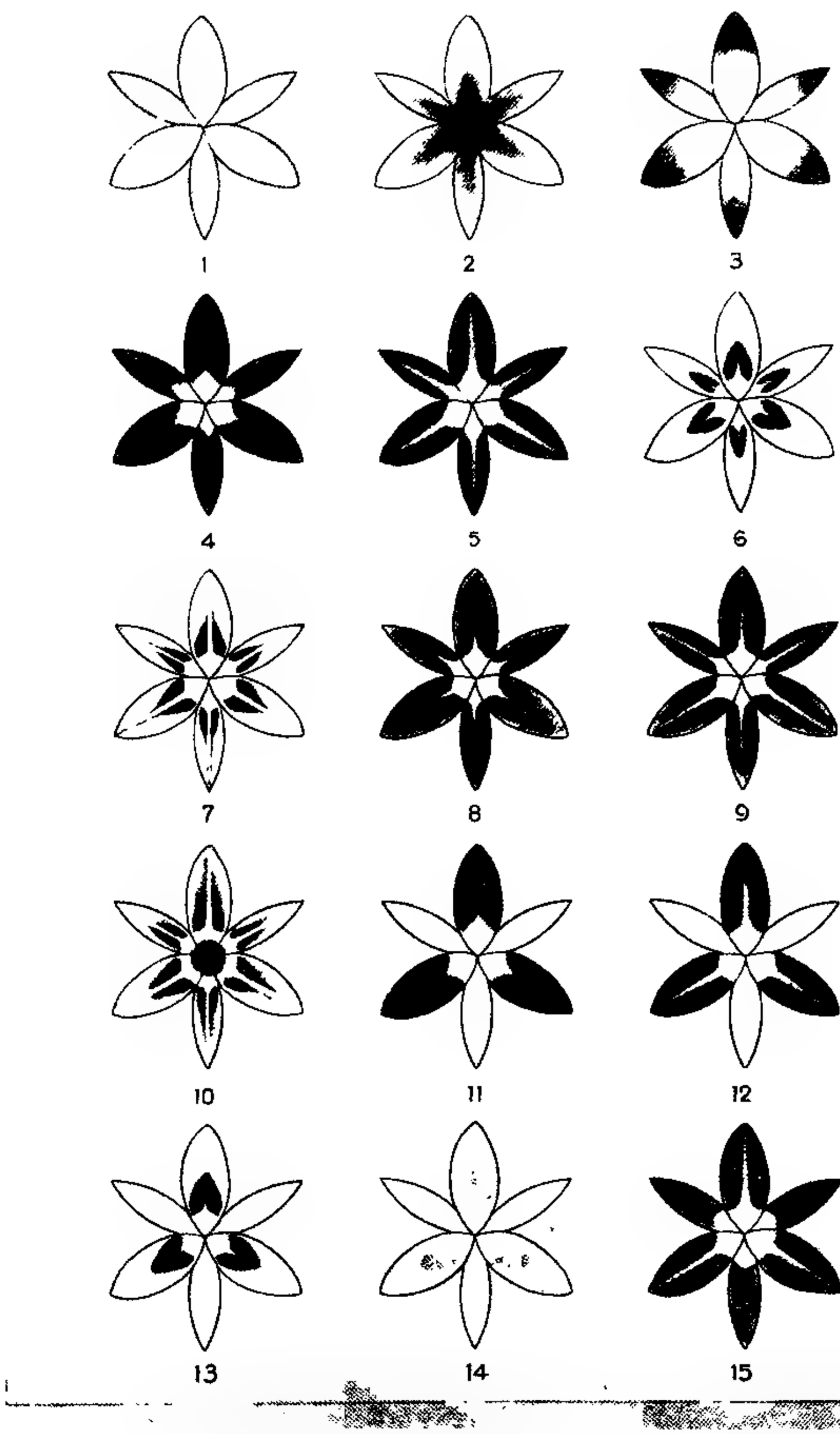


Diagram by Eleanor Clarke, through the co-operation of the W P.A.

Illustration showing the distribution of color and the principal patterns in flowers of Hemerocallis.

the periphery of the open flower. Several selections among seedlings of hybrid origin have this pattern.

B. *Two-toned patterns* have, usually, a throat of one color outside of which both sepals and petals are quite alike.

Distal; Fig. 4. For this the stronger or more noticeable pigment is at the outer portion of the flower, and often this is the red pigment which fails to appear elsewhere.

Distal and radiate; Fig. 5. This pattern differs from that of Fig. 4 in that the color of the throat extends outward along the midrib of petals and sepals.

Banded; Fig. 6. In the two-toned banded pattern there is a mid-zone in sepals and petals of more intense pigmentation, and usually this is a sap color, with the rest of the flower, both the throat and the outer part, of nearly the same coloring.

Banded and radiate; Fig. 7. The pattern last noted becomes radiate when the color of the throat extends through the band in each of the sepals and petals.

C. *Three-toned patterns.*

Banded; Fig. 8. In the fulvous and red-colored daylilies there is frequently a throat of plastid pigment outside of which there is the sap pigment which has greater intensity in the mid-zone.

Radiate; Fig. 9. Frequently in the two toned and three-toned concentric patterns the throat color extends outward along the midrib. When this becomes rather conspicuous the pattern appears as shown in Fig. 9.

D. *Four-toned patterns* have one more zone of distinctive tone than do three-toned patterns (Fig. 8). Usually the extreme throat is green, immediately outside of which there is yellow or orange, then there is a mid-zone of dark red and a periphery of a lighter tone. The pattern may be ***Concentric,*** as here described, or it may also have a ***Radiate*** feature, when it will appear as in Fig. 10.

III. Radial Patterns. In these the sepals and petals are different in some noticeable feature of coloring, and this condition dominates. The stronger and more intense coloring is usually in the petals. Hence the pattern is bicolored. The principal variations in design according to the coloring of the petals are: ***Distal,*** Fig. 11; ***Banded,*** Figs. 13 and 14; and ***Radiate,*** Fig. 12.

IV. Combination Patterns. The concentric and the radiate distributions of color may both be present and conspicuous in flowers, examples of which are seen in Figs. 5, 7, 9, 10, and 15.

Several unusual distributions of color have appeared which suggest that other somewhat distinctive patterns besides those here mentioned may appear in the horticultural daylilies of the future. Fig. 14 shows a scattered distribution in small spots of red pigment in the region of the mid-zone of the petals. The spots may be fewer and more widely distributed than is shown in this figure. Numerous seedlings of certain progenies have this character; and it is of interest to note that these plants are hybrids of parents which had no red coloration in the face of their flowers. If the spots of such a pattern should become much larger but still separated, a truly spotted pattern would result.

In various seedlings the red pigment in the blades of petals is much broken into irregular areas to give a flecked pattern. In several of the seedlings already obtained there is a rather narrow but noticeable band or border of lighter color at the edge of the flowers. The ***Saturn Daylily*** has the marginal banded feature to some degree. In certain seedlings the darker coloring in the outer edge of the face of the flower tends to break into irregularities that suggest a picoté pattern. In other seedlings the red pigments are noticeably broken into streaks. As these and other new patterns develop they will no doubt be noted and described, especially when they occur in newly named horticultural clones.

Henry Hurd Rusby—Explorer, Professor, Reformer, Botanist

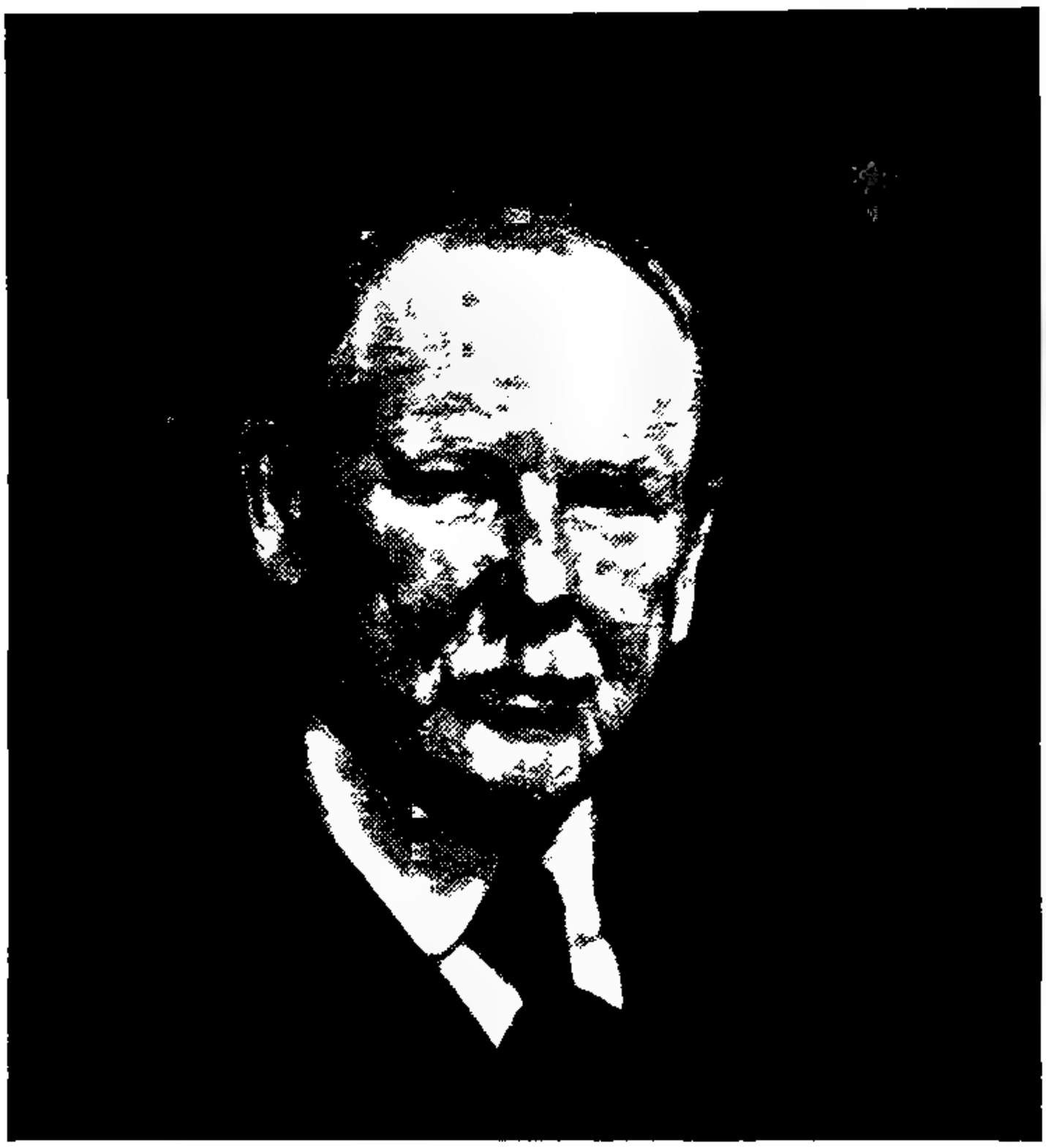
By Carol H. Woodward

WHEN he was still an obstreperous but eager schoolboy in Franklin (now Nutley), New Jersey, Henry Hurd Rusby began his first serious studies of plants at the age of 10. It was perhaps this interest, which absorbed him from such an early age, that made him finally content to stay at home, after three attempts to run away to become a "powder monkey" with Grant's army; and perhaps it was this same intentness on learning that made him give up a boyish desire to become a prize-fighter. He fought during much of his life—sometimes with his physical strength, as when fevers attacked him in the jungle, but mostly with wit and words in a series of struggles to raise and standardize the quality of products used for medicine and food and to raise the standards as well of those who were studying to dispense drugs to the public. It took three years to get a state law passed requiring one year of high school education for pharmacy students, and 25 years more to make high school graduation a requirement.

These continuous battles were carried on outside of his career as Professor of Pharmacognosy and Materia Medica and as Dean of the New York College of Pharmacy at Columbia University. And with all this he found ample time to organize, develop, arrange for display, label, and catalog the exhibit of more than 7,000 specimens of economic plant products which comprise the Museum of Economic Botany at the New York Botanical Garden.

Dr. Rusby was among the first of the men to work for the establishment of the Garden in the 1890's and before. He was listed as one of the Incorporators, and was appointed Honorary Curator of Economic Botany when the staff of the Garden was organized in 1898.

He was directly interested, he said in his first report to the Director-in-Chief, Dr. N. L. Britton, in establishing a department "on a more distinctly and systematically educational basis than is customary in institutions of this kind." The guide-book to the collection, as he planned it, would be "in the nature of a compendium on economic botany." It was just that, when it was published in 1921. In addition to a description of each of the 7,069 specimens and their uses, the plant products shown were classified under such headings as fibers, dyes, tanning materials, flavoring agents, waxes, beverages, fixed oils, volatile oils, fodders, woods, insecticides—the same headings under which they were grouped in the cases. Later, after his retirement from Columbia eleven years ago, he carried his work at the Garden further by placing on herbarium sheets cross-



HENRY HURD RUSBY
1855 - 1940
From a portrait made in 1929 by Boris Luban
Underwood & Underwood

references to the specimens in the Economic Museum. This vast collection that he built up for the Garden, largely by exchange and gift from other institutions, is not one to excite the interest of the public, but its completeness gives it special value for the student, particularly in pharmacy and economic botany.

The further association of Dr. Rusby with the Garden was well expressed by Dr. J. H. Barnhart in an address given Jan. 21 at a memorial meeting for the late dean at the College of Pharmacy of Columbia University. Dr. Barnhart said: "But Rusby's connection with the Garden was by no means limited to his post as an honorary curator. Until 1933 all of the activities of the institution were supervised by the Director, with the advice and approval of a Board of Scientific Directors. From 1900 to 1933, when this board was abolished, Rusby was one of its members, and he was its chairman for ten years, from 1908 to 1917. The Scientific Directors were responsible to the Board of Managers, and of this governing body they were ex-officio members."

The stories of Dr. Rusby's numerous plant-hunting expeditions are

well known. They might almost be said to have started in Essex County, New Jersey, for his early plant collections there won him a medal at the Centennial Exposition in Philadelphia in 1876. He was then 21 years old and had already studied at the Massachusetts State Normal School, at Hackettstown Collegiate Institution, and for a year in the College of Physicians and Surgeons at Columbia. He taught school for several years, worked as a clinical clerk to the medical staff at Blackwell's Island, and for three years he hunted for plants in New Mexico and Arizona as an agent of the Smithsonian Institution. Meanwhile he was studying in the Medical College of New York University, where he was graduated in 1884.

An early association with Parke, Davis & Co. of Detroit, to whom he had sold his herbarium to help pay his way through college, resulted in his being sent on three days' notice to hunt for cocaine in South America. This trip, which was recorded in a book called "Jungle Memories," published in 1933 by Whittlesey House, resulted in 45,000 botanical specimens, 4,000 species, being brought back, 20 percent of which were new to science. About 6,000 of these were deposited in the herbarium of the Botanical Garden.

The year after his return (1888) he was made Professor of Botany and Materia Medica in the New York College of Pharmacy, which later became the Department of Pharmacy at Columbia University. In 1905 he was appointed Dean of the Faculty, and upon his retirement in 1933 he was named Dean Emeritus.

Meanwhile he had also taught materia medica in the Bellevue Hospital Medical College; had been a member of the committee for the 7th and 8th revisions of the U. S. Pharmacopeia in 1893 and 1903; had served as adviser to the Department of Health of New York City; had been Pharmacognocist for the United States Department of Agriculture from 1907 to 1914, having been chosen first as an expert in the administration of the Pure Foods and Drugs Act in the United States. He had battled long and steadily for this act, first for its establishment, then for the vindication of Dr. Harvey W. Wiley, chief exponent of the act, with whom Dr. Rusby had been working closely from the beginning.

He had explored the Orinoco valley in 1893; Venezuela in 1896; Mexican rubber forests, 1908-1910; Colombia, in search of cinchona for war use, in 1917; other South American regions in search of caapi, the "fear" drug, in 1919 when he was 64 years old.

He had been elected a corresponding member of the Pharmaceutical Society of Great Britain, an honorary member of the Instituto Medico Nacional of Mexico, a member of the New York Scientific Alliance, and a fellow of the American Geographical Society; and he had served as chairman of the Pan American Medical Congress for the study of American medical flora, as vice-president and president of the Torrey Botanical Club, and as president of the American Pharmaceutical Association.

In 1923 he was awarded the degree of Master of Pharmacy by the Philadelphia College of Pharmacy, and in 1930 Doctor of Science by Columbia. The Daniel Hanbury medal of the Pharmaceutical Society of Great Britain was presented to him in 1929 for his original research in the natural history of chemistry in drugs, and in 1937 the Flückinger medal of the National German Apothecary Association in recognition of his 65 years of devotion to the sciences of medicine, pharmacy, and botany. He was chiefly responsible for the introduction into American medical practice of a number of plant products, among them cocaine, pichi, cocillana, and cascara sagrada.

Originally he had made an agreement with Parke, Davis & Co. for a royalty from certain of his introductions, but with characteristic forthrightness, he ended the agreement, believing that drugs made available for the healing of mankind should be of benefit to all and not for the profit of any one man.

Throughout these years of teaching, exploring, battling for reform, instituting standards which have affected the practice of pharmacy throughout America, Dr. Rusby found time to work in close association with the New York Botanical Garden.

"From what has been said," Dr. Barnhart told his audience in concluding his address at the Rusby memorial meeting, "it appears that Rusby was intimately connected with the scientific work of the Garden for 42 years and with the details of its management for 34 years. For several years past the state of his health permitted very few visits to the institution, and there have been so many changes in the staff by retirement, by resignation, and by death, that few of those now active in the work of the Garden remember him clearly. He has already taken his place as an almost legendary figure, but his long years of activity with the conduct of the New York Botanical Garden during its formative period assure him a secure place in its annals."

Current Literature At a Glance*

Tomatoes. Cornelius H. Muller has written "A Revision of the Genus *Lycopersicon*" which is issued as Miscellaneous Publication No. 382 of the U.S.D.A. In its 28 pages it contains descriptions of six species and several forms, illustrated in 10 plates.

Rose Cuttings. Results of using root-inducing substances in the propagation of roses from cuttings is reported by Henry Kirkpatrick, Jr., in the *American Nurseryman* for Nov 15, a reprint of which has recently been received from the Boyce Thompson Institute.

Winter Weeds. E. Laurence Palmer of Cornell has written on "Weeds Above the Snow" for the January number of the School Nature League Bulletin in New York. Photographs are shown of eight familiar plants as they appear in their winter setting.

* All publications mentioned here -and many others— may be found in the Library of the Botanical Garden, in the Museum Building.

Rare Orchid. T. MacDougall is responsible, through his explorations in Mexico, for bringing back into cultivation a rare and little-known orchid, *Meiracyllium trinasutum*, according to E. J. Alexander in the November number of the American Orchid Society Bulletin. This orchid, which is now growing at the New York Botanical Garden, is a small plant with soft rose-purple flowers, the lip white with rose-purple spots. It was first known in 1854, but was subsequently lost to cultivation.

Propagation. John V. Watkins of the University of Florida, who contributed to the Journal of the New York Botanical Garden in October 1939, has prepared a booklet of 54 pages (Bulletin 347) on "Propagation of Ornamental Plants" for the Agricultural Experiment Station.

Argentina. The Botanical Garden has received volumes 14 through 18 of *Physis,* the Review of the Argentina Society of Natural Sciences, dealing with the Second Reunion of Natural Sciences at Mendoza in April 1937. These five volumes deal chiefly with biology, with one devoted exclusively to botany.

Notes, News, and Comment

Expedition. Otto Degener, whose headquarters are in Honolulu, wrote from Suva, Fiji, early in December that he had been botanizing for about a week at Nadarivatu, while awaiting the arrival of other members of the Archbold Scientific Expedition. Prof. John W. Coulter of the University of Hawaii was already there, as was Mr. Degener's assistant, Emilio Ordonez. One set of the plants collected in Fiji is to be sent to the New York Botanical Garden. Upon the arrival at Suva of Mrs. Anne Archbold, Mary Keegan, R. Tucker Abbott, and John Swingle, the party planned to sail in Mrs. Archbold's yacht *Cheng Ho* to the Gilbert and Ellice Islands and other points in the western Pacific. Mr. Degener meanwhile has been working on a flora of Fiji, with B. E. Parham, local botanist, as collaborator.

Sigma Delta Epsilon. Dr. Dorothy Day, Associate Professor of Botany at Smith College, who is spending her sabbatical year at the New York Botanical Garden, was elected National President of Sigma Delta Epsilon, graduate women's scientific fraternity, at the national convention held in Philadelphia the last of the year. Dr. Mary Bartley Schmidt of Fayetteville, Arkansas, who worked in Dr. Robbins' laboratory in 1938, was elected National Treasurer. Dr. Roberta Ma, who is also doing special work on vitamin research at the Garden, was initiated as a member-at-large at the Philadelphia gathering. Dr. Day was chairman last year for the organization of the society's national research fellowship for women in science, the first announcement of which was made at the recent meeting. Applications for the first award of the fellowship will be received up to March 15 by the national secretary, Dr. Nina E. Gray of Illinois State Normal University.

Annual Meeting. Three members of the Board of Managers who had been elected during the past year were made members of the Corporation of the New York Botanical Garden at the annual meeting held Jan. 16 in the office of President Joseph R. Swan. They were Henry F. du Pont, Prof. Marcus M. Rhoades, and F. E. Powell, Jr., the last elected to the Board at the November meeting. All officers of the Garden were re-elected, and the seven managers whose terms were expiring were re-elected to the class of 1944. An executive committee to consist of Henry de Forest Baldwin, Henry F. du Pont, Pierre Jay, Clarence McK. Lewis, Prof. Rhoades, and Dr. William J. Robbins, besides the President and Treasurer, was appointed to serve during 1941. Pierre Jay and H. Hobart Porter were named, with Mr. Swan as President and Arthur M. Anderson as Treasurer, to the Finance Committee for the year, while Clarence McK. Lewis, Dr. E. D. Merrill, Franklin F. Hopper and Herman A. Spoehr were chosen for the Scientific Committee. Mr. Baldwin was appointed as the single member of the City Relations Committee.

Deaths. Mrs. Robert Bacon, who was a charter member of the Women's Auxiliary of the New York Botanical Garden when it was organized in 1914, died in November. She had continued her association with the Garden as a member of the Advisory Council and of the Corporation.

Alfred J. Crane, a member of the Corporation for the past three years, died on Sept. 15.

Memorial. Dr. J. H. Barnhart represented the New York Botanical Garden Jan. 21 at a memorial meeting honoring Dr. H. H. Rusby at the College of Pharmacy of Columbia University, of which Dr. Rusby was Dean for 25 years. Dr. Barnhart spoke on Dr. Rusby's work with the Botanical Garden. Other speakers were the present Dean, Dr. Charles W. Ballard; President Nicholas Murray Butler; Dr. W. A. Bastedo; and Dr. William Jay Schieffelin, who also spoke at the 25th anniversary dinner given for Dr. Rusby by the College of Pharmacy late in 1913.

Diatom Program. More than 100 persons attended the program on Jan. 11 to mark the formal opening of the study room for diatoms and myxomycetes at the Botanical Garden, and at the public lecture given at 3 p. m. that day by Joseph F. Burke on "The Beauty of the Diatom World," there were 325 in attendance. Dr. John A. Small, Chairman of Field Trips for the Torrey Botanical Club, presided at the earlier meeting, introducing Dr. William J. Robbins, Dr. Fred J. Seaver, Robert Hagelstein, and Mr. Burke, all of whom gave short addresses. Members of the Torrey club and of the New York Microscopical Society joined members of the Garden in attending the program, before and after which they looked at exhibits of materials from the cryptogamic herbarium and at the diatom photomicrographs by Philip O. Gravelle. Among those who attended were Dr. Thomas S. Stewart of Philadelphia; Wardlaw M. Hammond of Cambridge; John B. Woodward of Bridgeport, and H. W. Zieler of New York, President of E. Leitz, Inc.

Visitors. F. W. Dunning of Douglaston, L. I., visited the Garden Sunday, Jan. 19, and left two rare specimens of diatoms for the Garden's collections. They represent separations from a cleaning of the famous Santa Monica Floating Fossil of 1889, which had been collected for Mr. Dunning off the coast of California. The separations were made by J. R. Bartholemew of the Farlow Herbarium.

Dr. James W. Lesley of Riverside, Calif., who is interested in the training of student gardeners, made a visit to the Garden the first of the year. Another California visitor at that time was Dr. D. Appleman of Los Angeles, who was interested primarily in the methods used in the cultivation of excised roots in the laboratory. Among others who registered during January were Carl W. Sharsmith, University of Minnesota; Edgar T. Wherry, U. of Pennsylvania; E. L. Proebsting, U. of California; Charles J. Chamberlain, U. of Chicago; J. F. S. Esper, Château de la Guelère, Faye-la-Vineuse, France; E. D. Merrill, Arnold Arboretum; William R. Van Dersal, Washington, D. C., and Seth Pope, Cornell University.

Flora. J. P. Anderson, who spent three weeks at the Garden the first of the year, doing research toward a flora of Alaska, left to continue his work at Harvard and in Washington. He plans to return to Juneau early in the spring.

Conference. Members of the staff who attended the Philadelphia meetings of the A.A.A.S. after Christmas gave brief reports at the January conference of the scientific staff and registered students of the Garden.

Substitute. Mrs. Clyde Fisher, who is well known on the lecture platform by her Indian name of Te Ata, spoke in place of her husband at the opening of the winter series of Saturday afternoon lectures at the Garden, Jan. 4, when Dr. Fisher was obliged to substitute for a member of his own staff at the Planetarium. Kodachromes and motion pictures taken by Dr. and Mrs. Fisher throughout the country during the past year were shown.

Lectures. "Plants Used by the North American Indians" was the subject of G. L. Wittrock Dec. 3 before the Laurel Garden Club of East Hartford, Conn., an affiliate of the Botanical Garden. Dr. A. B. Stout spoke on "Lilies for Gardens" before the South Orange Garden Club, another affiliate, Nov. 4. Recent lectures given by Dr. H. N. Moldenke include "Plants of the Bible" at the Fellowship Guild of St. George's Church and "A Naturalist in Florida" before a group of Westfield, N. J., clubs on Jan. 7 and in November at the annual dinner of the Watchung Nature Club.

Student Gardeners. Charles Pecora, apprentice gardener, left the Botanical Garden at the end of the year to become assistant gardener on the estate of Mrs. H. M. Tilford at Tuxedo Park. He is succeeding Martin J. Crehan, former student gardener, who has taken a new position in Philadelphia.

THE NEW YORK BOTANICAL GARDEN

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PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures, covering the algae, fungi, mosses, ferns, and flowering plants. 1918. $3.50.

A Text-Book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Periodicals

Addisonia, annually, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume Now in its twenty-first volume. Subscription price, $10 a volume (four years). Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1 a year, single copies 10 cents. Free to members of the Garden. Now in its 42nd volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $7 a year; single copies $1.25 each. Now in its thirty-third volume. Twenty-four Year Index volume $3.

Brittonia. A series of botanical papers. Subscription price, $5 a volume. Now in its fourth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes, each to consist of four or more parts: 90 parts now issued. Not offered in exchange. Prices of the separate parts on request.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each, $5 a volume. In the fourteenth volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Prices to members of the Garden: Vols. 1-6, $1.50 each; to others, $3. Vol. 7, $2.50 to members; to others, $5 *Contents:* Vol 1, PER AXEL RYDBERG, An Annotated Catalogue of the Flora of Montana and the Yellowstone Park. Vol 2, D T. MACDOUGAL, The Influence of Light and Darkness upon Growth and Development. Vol. 3, ARTHUR HOLLICK and E C JEFFREY. Studies of Cretaceous Coniferous Remains from Kreischerville, N. Y. Vol. 4, C STUART GAGER, Effects of the Rays of Radium on Plants. Vol. 5, NORMAN TAYLOR, Flora of the Vicinity of New York. Vol. 6, Twentieth Anniversary of The New York Botanical Garden. Vol. 7, N. L. GARDNER, New Myxophyceae from Porto Rico; A. B. STOUT, The Flower Behavior of Avocados; H. H. RUSBY, Plants Collected in the Amazon Valley; ARTHUR HOLLICK, The Flora of the Saint Eugene Silts.

* * *

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CAROL H. WOODWARD, Editor
March 1941

CEDAR ON MOUNT LEBANON
Cover photograph from Plate 127, Vol. 3, of The Trees and Shrubs of Great Britain by Henry John Elwes and Augustine Henry.

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TWO INTENTIONS IN GARDENING

A common intention in ornamental gardening is to produce a succession and display, to contribute to the pictorial and perhaps the artistic expression of the property. Mass effects are highly prized. To this end there are abundant good materials in plants and much skill is expressed in the growing and placing of them One marvels at the results, as they are seen in grounds and in the exhibitions.

Yet there is quite another intention. This is the personal satisfaction in the plant itself, for what it is, its habits, colors, seasons, with only secondary relation to design and pictorial effect. This may be the satisfaction of those who know the different kinds of plants rather closely, who take note of leaf size and shape and habit as well as of flowers and who try to find the essential differences between varieties or species.

This second intention of gardening may be highly ornamental under skilful hands and may cover the area in harmony, yet the particular joy is in the exercise of critical faculties and keen close observation. Gardeners of this class are likely to become specialists, for their interest leads them to individual plants and often to growing a collection of all that they can find of one class or species. Such a gardener eventually becomes an authority on the group.

There is not necessarily a conflict between these two purposes in gardening. A botanical garden through its landscaped grounds and displays, its collections of living plants, and its reference materials, contributes in an important way to both

L. H. Bailey

SPECIAL FLOWER SHOW NUMBER

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York, N Y. Entered at the Post Office in New York, N. Y., as second-class matter. Annual subscription $1 00. Free to members of the Garden. This 32-page issue 15 cents.

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VOL. 42 MARCH 1941 NO. 495

Biblical Plants At Flower Show

AT the International Flower Show in Grand Central Palace, New York City, March 17-22, 1941, the New York Botanical Garden is exhibiting about seventy-five plants which are mentioned in the Bible. The occasion is being preceded by a lecture at the Garden on Saturday afternoon, March 15, on "Plants of the Bible" by Dr. Harold N. Moldenke, Associate Curator.

During the past few years Dr. Moldenke has made a thorough survey of books and pamphlets concerned with Bible botany, and he has brought together in one paper (now out of print) all of the botanical species that have a claim to be mentioned as Bible plants. A selected list of these plants, compiled from his paper and accompanied by Biblical quotations, appears in this number of the Journal.

Also based primarily on his study is the article on "Plants of the Holy Scriptures" presented here by Eleanor King. Miss King is the author of a number of books and magazine articles dealing with natural history. Much of the research for her writings is done at the New York Botanical Garden, and she has prepared the present article especially for this Journal.

Many of the plants discussed may be seen at the Flower Show, and some of them form part of the year-around displays in the Botanical Garden's conservatories.

Plants Of The Holy Scriptures

The Vegetational Background Of The Bible Viewed In The Light Of Modern Knowledge

By Eleanor King

MANY of the plants that are mentioned in the Bible can be seen at our very doorsteps today. We cultivate them in the flower and herb garden and in the vegetable patch; they thrive in the orchard or form the hedge; yet few of us ever realize that we are growing some of the same plants that Moses looked upon as he led the Children of Israel to the Promised Land, the same plants that grew in Solomon's garden, the same plants of which Isaiah and Ezekiel, Amos and Hosea spoke in their prophecies, the same plants that Jesus and his disciples walked among.

The humble onion and leek, the dill, mint, and rue, and many of the fruits and grains of our present-day lives were also part of the everyday lives of the Bible people. Today in America we grow the almond, the apricot, the fig, the olive, the pomegranate and the vine even as did those people who were making Bible history more than 4,000 years ago. Today wheat is the staff of life for us even as it was for them. These plants have come down to us through the centuries, making a living link between us and the people of those hallowed and distant times.

Plants play such a deep and significant role all through the Scriptures that it is difficult to imagine the Bible stripped of its vegetation. From the first chapter of Genesis when the beautiful legend of creation is given, to the last chapter of Revelation, plant life is essential to the flow of history, to the prophecy, wisdom and poetry of the book. It was only natural, then, that a special study of the plants of the Bible attracted the attention of theologians, historians and scholars.

As soon as the scholars began to scrutinize these Biblical plants with critical eyes, they discovered errors in terminology. Early translators and scribes had been unconcerned about whether they called a rose a lily or a lily a rose. Was the rose of Sharon a true rose, or a plant with a bulb-like root, or something different from either? When Isaiah said, "The desert shall rejoice and blossom as the rose," did he refer to a flower of the Rose or of the Lily family? The Alexandrian translators of the Old Testament called this particular rose "lily;" the Chaldee and Arabic translators called it "narcissus." Others thought the rose may have been a mallow, a crocus, an amaryllis or an anemone. But there was one thing certain—hardly anyone, except the layman, thought it was a true *Rosa.*

And so the controversy about the plants of the Bible became the particular province of the philologists and etymologists. They examined

and re-examined the oldest Hebrew and Greek texts, all the different translations and versions, comparing the names of plants in each, searching the names for their original meanings. The Hebrew and Greek names used for the plants are seldom directly translatable into our language—their plant names usually imply much more than do those of our language.

There were a number of ways in which errors crept into Bible manuscripts. In the first place, some errors must have been made by the early

Photograph by courtesy of the Bureau of Plant Industry, U.S.D.A.

"Today wheat is the staff of life for us even as it was for them."

bards and singers who passed Bible history from generation to generation by word of mouth. Then when the material was written down, and manuscripts began to collect, they were copied and re-copied by scribes who often made mistakes unwittingly, or who deliberately altered the text according to their own notions. It is believed that by the second century after Christ the Bible had become "set," that it had become the Bible as

Photograph of fig tree reproduced by courtesy of the Bureau of Plant Industry, U.S.D.A.
Leaves and fruit from page 97, Vol. 1, of Nees von Esenbeck's "Plantae Officinalis," 1828.

"The most frequently mentioned plants of the Bible are the fig, the olive, and the vine. They were basic to the economic life of the people." The fig tree and its fruit are shown here.

we know it today. However, we have none of the old manuscripts. The oldest Hebrew manuscript known to the world is the Masoretic, which was written in the sixth, seventh and eighth centuries.

The etymologist, then, could not go all the way back to the beginning of the written Bible in his pursuit of plant names. Some other means

of approach was needed if new light was to shine upon the subject—and that is where the botanist stepped in!

The botanist made a simple suggestion—one so obvious that it had not been thought of before: "Why not go to the Holy Land and see which plants are actually growing there?"

This suggestion came from Linnaeus about the middle of the eighteenth century. Linnaeus, "father of botanical nomenclature," had become convinced that particular plants were limited to particular parts of the world; therefore, the plants that were native to Palestine were probably not the same plants that were native to western Europe. This is such a commonplace idea to us today that it seems strange that less than two hundred years ago it had yet to be proved.

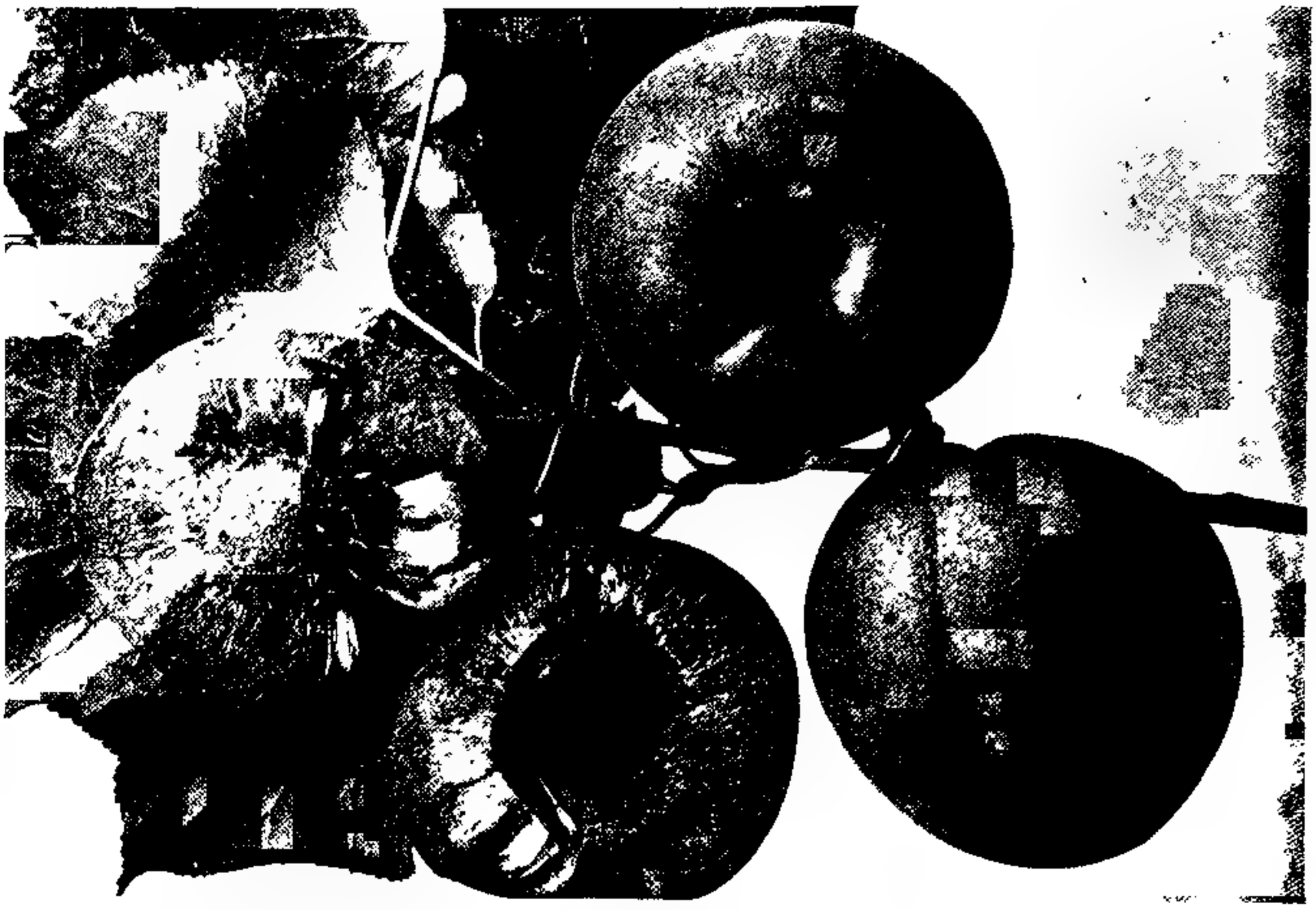
Followers of Linnaeus soon embarked for Palestine to make a study of the flora—and so was ushered in a new epoch in the study of Bible plants. Since then many botanists and botanically-minded churchmen have explored the area and studied the plants of the Holy Land. The writings about the plants of the Bible have increased steadily; Bible plant-lore now has become Bible botany.

This information, however, has been scattered over a very large field, and Dr. H. N. Moldenke has performed a valuable service in digesting it into one readable and accurate paper, in which he discusses and attempts to identify in the light of modern knowledge 181 species (including about ten fungi, algae, lichens, and bacteria), all of them plants that are mentioned in the Bible.

Although the botanist has brought science to the aid of the Bible, this does not mean that he challenges the truth of the Bible. The challenge is only to the mistakes that have been committed through human frailty. As an individual, the botanist may be among the most devout believers in the Scriptures. But he is also a devout disciple of science; his zeal to identify plants, to determine a species correctly, always burns at white heat. As a man of religion he may find complete spiritual satisfaction in the significance of the parable, "The kingdom of heaven is like to a grain of mustard seed," but as a scientist he can not rest until he knows *which* mustard seed it was!

The mustard seed of Scriptures has caused controversy because Jesus, in his parable, went on to say that the plant grew tall enough and sturdy enough to form a resting place for birds. The quotation from MATTHEW *13*: 31-32 reads:

> Another parable put he forth unto them, saying, The Kingdom of heaven is like to a grain of mustard seed, which a man took and sowed in his field:
>
> Which indeed is the least of all seeds: but when it is grown, it is the greatest among herbs, and becometh a tree, so that the birds of the air come and lodge in the branches thereof.



Photograph by courtesy of the Bureau of Plant Industry, U.S.D.A.

"But the apple—made famous by Eve—seems to be anything but an apple! It is not even mentioned in the story of the Garden of Eden . [but] its name occurs in other parts of the Scriptures. Most authorities believe that these apples were apricots."

The black mustard, *Brassica nigra,* is held by most authorities to be the mustard of the Bible. As it grows along roadsides and waste places in Palestine today, usually it is a plant three or four feet in height, but also it is found growing as high as ten and fifteen feet, with a main stem as thick as a man's arm. Although it is an annual, the stems and branches become hard and rigid enough in autumn to hold the birds that come to it for seeds.

* * * *

The most frequently mentioned plants of the Bible are the fig, the olive and the vine. They were basic to the economic life of the people, and the writers of the Scriptures used them as symbols more than they did any other plants. There has been no controversy about their identity, nor about that of the almond, the palm tree, and the pomegranate which were also fundamental to the life of the times.

But the apple—made famous by Eve—seems to be anything but an apple! It is not even mentioned in the story of the Garden of Eden. According to GENESIS 2: 8-9:

> And the Lord God planted a garden eastward in Eden; and there he put the man whom he had formed.

> And out of the ground made the Lord God to grow every tree that is pleasant to the sight, and good for food; the tree of life also in the midst of the garden, and the tree of knowledge of good and evil.

No specific tree is mentioned until after Eve had tasted the fruit, and Adam also, and they were ashamed of their nakedness; then in GENESIS *3*:7 we learn that:

> . . they sewed fig leaves together, and made themselves aprons.

This statement has led many people to believe that the fig-tree was the "tree of knowledge;" but the apple-tree has replaced it in the popular conception, and has been shown in many paintings of the temptation of Eve.

Although the apple is not mentioned in Genesis, its name occurs in other parts of the Scriptures. Moses and Zechariah both assert that to God, Israel is "as the apple of his eye." In Proverbs "a word fitly spoken" is said to be "like apples of gold." King Solomon, in thinking of the charms of his Bride, remembers that her breath is fragrant as apples: ". . the smell of thy nose like apples." (SONG OF SOLOMON 7:8.)

From his Bride we learn more about apples. In SONGS *2*: 3-5 she sings:

Photograph by courtesy of the Bureau of Plant Industry, U.S.D.A.

"There has been no controversy about [the] identity . of the pomegranate." The pomegranate which is cultivated in America today is one of the same fruits for which the Children of Israel longed when they were wandering in the Wilderness.

As the apple tree among the trees of the wood
so is my beloved among the sons.

I sat down under his shadow with great delight,
and his fruit was sweet to my taste.
He brought me to the banqueting house,
and his banner over me was love.

Stay me with flagons, comfort me with apples:
for I am sick of love.

Most authorities believe that these apples, which were golden, sweet to taste, sweet to smell, and which grew on a tree whose shadow was a great delight, were apricots, *Prunus Armeniaca.* Apricots grow abundantly in Palestine today, and it is believed that they were introduced about the same time as the grapevine, so they must have been plentiful in Bible days.

Although some botanists have argued in favor of the orange, *Citrus Aurantium,* the citron, *Citrus medica,* and the quince, *Cydonia oblonga,* almost everyone is agreed that the apple, *Malus pumila,** could not have been growing in Palestine in that early time. Even if apples had grown there in Old Testament days they would hardly have been referred to in such glowing terms, because these fruits originally were small and acid. The apple as we know it today might fit the Biblical descriptions, but it is of comparatively recent origin, having been improved by selection centuries after the Bible was written.

The apple seems to be the one controversial plant among the fruit trees of the Bible, but the disagreement about other trees—the oaks, mulberries, sycamores, firs, poplars, willows, chestnuts, and junipers—could fill several volumes. The King James version, responsible for a number of misnomers in the botany of the Bible, calls the aspen a mulberry and the mulberry a sycamine; the juniper is called a heath; the box is called ivory; the cypress is called a box; the terebinth is called elm, and the plane-tree becomes a chestnut.

Of the most magnificent forest tree of the Bible there is no confusion, however. The cedar of Lebanon was noble and splendid; it filled all who saw it with awe and reverence; it was the symbol of mighty strength and power. The cedars in the Forest of Lebanon were the trees of Jehovah, the masterpieces of God. They are mentioned in the books of history, in the books of prophecy, in the Songs of Solomon and in the Psalms. They were the trees that, for twenty years, fell beneath the ax so that the spectacular private palace and temple of Solomon could be built. Solomon sent 30,000 Israelites, 150,000 captive slaves, and 3,300 officers to make war against these majestic and valuable trees.

The cedars of Lebanon and the forests of firs, pines, and oaks were plundered through the centuries by kings and devastated by wars. The conservation-minded citizen of today knows that the forests have an important effect on climate, on soil and on water supply. The ancients

* More correctly known as *Pyrus Malus* var. *paradisiaca.*

Photograph by courtesy of W. C. Lowdermilk

"The cedars in the Forest of Lebanon were the trees of Jehovah, the masterpieces of God. . They were the trees that, for twenty years, fell beneath the ax so that the spectacular private palace and temple of Solomon could be built."

were not conservationists; there were no reforestation projects under the rule of the kings or the foreign conquerors. The forests were plundered during times of peace, and devastated during war both by the ax and by fire, so that today many hills are barren that at one time supported a good population of trees.

* * * *

The cedar of Lebanon represented the greatest thing in the vegetable kingdom, and the hyssop the lowliest, the most humble plant, for it was said of Solomon, in describing his wisdom, that he could talk upon any subject, from "the cedar tree that is in Lebanon even unto the hyssop that springeth out of the wall." (I KINGS 4:33).

And this innocent, humble hyssop has stirred up more controversy than any other plant mentioned in the Bible; at least it has consumed more pages of discussion, and every writer or reader familiar with hyssop literature will tell you that Celsius, author of the *Hierobotanicon*—that foundation stone of Biblical botany—devoted forty-two pages to this subject and discussed eighteen kinds of plants without ever arriving at a conclusion!

Was the Biblical hyssop the marjoram, *Origanum aegypticum*; the caper-plant, *Capparis spinosa*; the sorghum, *Holcus Sorghum*; the maidenhair spleenwort, *Asplenium Trichomanes*; or the wall-rue, *A. Ruta-muraria?* It may have been any one of these, so say the authorities, but never, never could it be the hyssop of our herb gardens, the plant which Linnaeus

called *Hyssopus officinalis,* which is native to southern Europe but not to the Holy Land or Egypt.

Three different localities are concerned in the references to hyssop—Egypt, the Desert of Sinai, and Palestine; and so if the hyssop of the Bible is always to be the same plant, it must be a plant that grows in all three places. Marjoram has come to be favored by many authorities because, of the several species that grow in the East, one or another would have been available for each reference.

" *the Israelites were in the habit of using the sorghum inflorescence spikes for brushes and brooms . .*" *This reed-like plant is believed by many to be one of the hyssops of the Bible.*

The hyssop is mentioned in connection with the Great Deliverance from Egypt. God had instructed Moses to take the Children of Israel out of Egypt, but Pharaoh would not let them go because they were good slaves. In order to convince Pharaoh that he would be better off if he were to let Moses and the Israelites leave, Egypt was visited with plagues of frogs and lice, flies, hailstorms and locusts. But Pharaoh was stubborn, and would not permit the Israelites to leave until the Destroying Angel passed through the land claiming all the first-born, not only in the homes of

Pharaoh's people, but in his own home as well. So that the Israelite households should be spared on this dreadful night of doom, each was to be marked with the blood of the sacrificial lamb. Moses, in EXODUS *12*:22, instructed his people: "And ye shall take a bunch of hyssop, and dip it in the blood that is in the bason [basin] and strike the lintel and the two side posts with the blood that is in the bason."

Since this command came on short notice, the students of Biblical botany ask which plant would have been available for more than a hundred thousand families? Marjoram and the caper could both have met the demand, say the champions of these plants. Other authorities uphold the sorghum not only on the basis that it would have been sufficiently plentiful, but also because the Israelites were in the habit of using the sorghum inflorescence spikes for brushes and brooms; therefore, it was the natural thing to use them as brushes for the sprinkling of blood at a time of crisis.

After having been delivered from Egypt, the Children of Israel encamped in the Desert of Sinai, where they received in addition to the Ten Commandments, certain other laws and instructions; one was the law regarding the cleansing of the leper, and the use of hyssop is mentioned as part of the ceremony. Marjoram and the caper are put forth as the hyssop of this reference (LEVITICUS *14*:4, 6, 52), and as both were available it is difficult to choose between them. Hyssop is mentioned in other books, also, in connection with the cleansing of body and spirit; from PSALMS *51*:7 comes the familiar passage:

> Purge me with hyssop, and I shall be clean:
> Wash me, and I shall be whiter than snow.

In the New Testament (JOHN *19*:29), a sponge filled with vinegar was placed upon a hyssop and raised to touch the lips of Jesus. In Matthew and Mark this instance is also mentioned, but the word "reed" appears instead of "hyssop." The champions of sorghum put forth their choice here; they have a better case than the contenders for the caper-plant, since the caper is inclined to spread itself as a vine rather than to hold its stems upright, so that it may not have been long enough or rigid enough to be used as a stick. The claim for marjoram seems to rest upon the fact that the strong scent of this herb would have been refreshing to the suffering Savior.

So, like Celsius, most of the Biblical botanists rest the case without coming to any definite conclusions; the safest thing to say is that several different plants must have been the "hyssop" of the Bible.

Of the other herbs of the Bible there seems to be little dispute. The mint, rue, coriander, cummin, and wormwood are species which can be grown in herb-gardens today and called by their Bible names; only the anise seems to be a mis-translation, practically everyone agreeing that the plant meant was dill.

Among the vegetables of the Bible are cucumbers, watermelons, onions, leeks and garlic. These plants were grown in both Egypt and Palestine and figure in references concerning both places. But the best-known reference concerns the discontent of the Children of Israel when they were wandering in the Wilderness. The Wilderness was desert country and did not yield the rich fruits of the fertile Nile Valley. The wanderers had plenty to eat because God sent them manna every day for forty years; but they tired of manna and didn't mind saying so. In NUMBERS *11*:5, 6 they complain to Moses:

> We remember the fish, which we did eat in Egypt freely;
> the cucumbers and the melons, and the leeks, and the onions
> and the garlick:
>
> But now our soul is dried away: there is nothing at all,
> besides this manna, before our eyes.

They remembered Egypt and not only did their mouths water for its juicy cucumbers but for its figs and pomegranates, as well. And in NUMBERS *20*:5 they said:

> And wherefore have ye made us to come up out of Egypt,
> to bring us in unto this evil place? It is no place of
> seed, or of figs, or of vines, or of pomegranates;
> neither is there any water to drink.

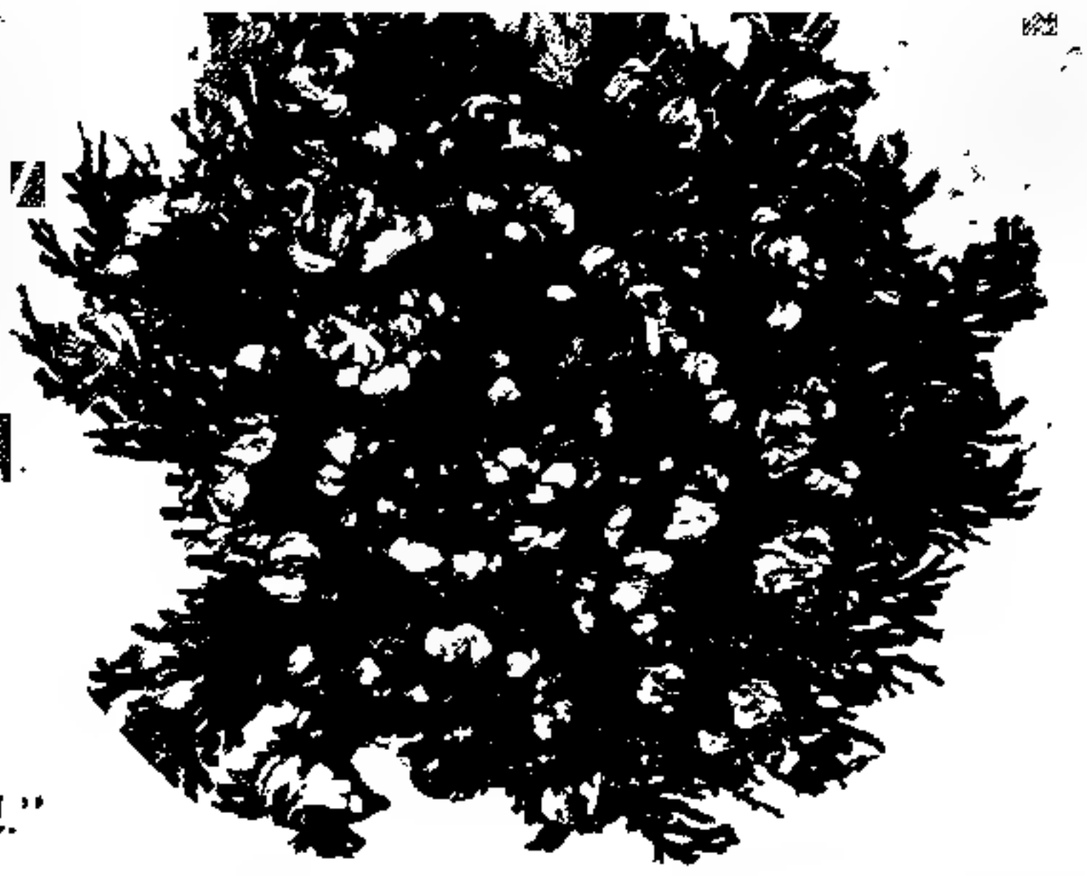
Of the manna which "fell from heaven" there are two interesting explanations. Part of the manna is believed to have come from the lichens, *Lecanora esculenta* and *L. affinis*. Today, vast tracts of barren plains and mountains in many parts of western Asia and northern Africa are occupied by these lichens; sometimes they are lifted by the wind and carried away to be deposited in places where the lichen is unknown except when it falls out of the sky. In 1854 a shower of these lichens fell in Persia during a great famine, much to the joy and thanksgiving of the inhabitants. A similar lichen grows on the Sahara Desert and is gathered regularly by the natives for food in time of scarcity. It can be cooked in various ways and made into bread.

An alga of the genus *Nostoc* is supposed to have been a part of the manna received by the Children of Israel as they wandered in the Wilderness. This alga has been known to grow with unbelievable rapidity during the night when there is an abundant fall of dew and the surface of the ground is wet. Being very soft and gelatinous, these algal growths disappear as soon as the sun comes up and dries the surface of the ground. EXODUS *16*:21 indicates that this type of manna was present:

> And they gathered it every morning, every man according
> to his eating: and when the sun waxed hot, it melted.

* * * *

When we turn to the lilies of the Bible, we come upon the most beautiful flowers of the Holy Land, and upon one of the most beautiful verses spoken by Jesus, from MATTHEW *6*:28-30:



This "resurrection plant," shown dried and "resurrected." is Selaginella lepidophylla, a native of Mexico.

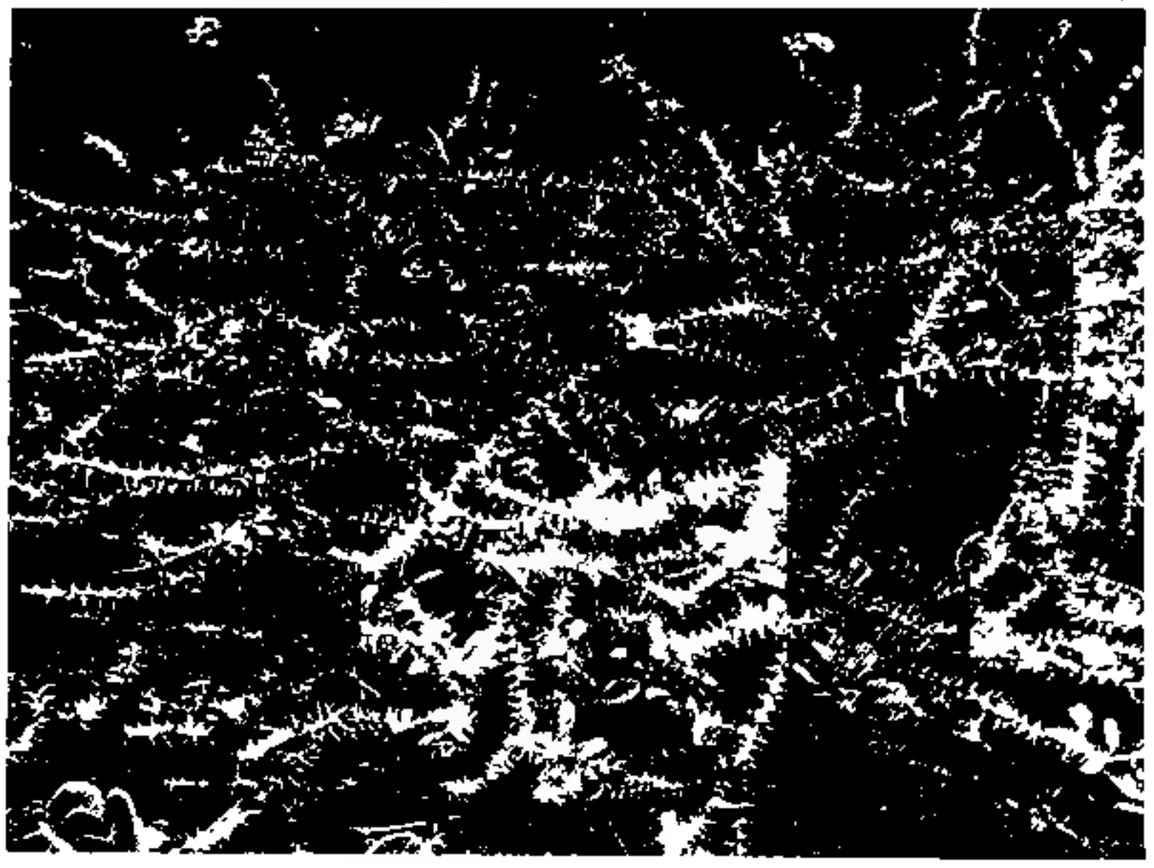
The prickly-pear cactus did not grow in the Holy Land until recent times.

THESE PLANTS DO NOT OCCUR IN THE BIBLE

Though they are often associated with stories from the Scriptures.

The passion-flower was given religious significance by the Spaniards who discovered it in South America.

The "crown of thorns" shown here is Euphorbia splendens, a native of Madagascar, hence unknown in Palestine at the time of Christ.



"Easter lilies" come from Asia, not the Holy Land.

Roses were not the roses we know today. Some were oleanders, others probably tulips and narcissi.

> And why take ye thought for raiment? Consider the lilies of the field, how they grow; they toil not, neither do they spin:
>
> And yet I say unto you, That even Solomon in all his glory was not arrayed like one of these.
>
> Wherefore, if God so clothe the grass of the field, which today is, and tomorrow is cast into the oven, shall he not much more clothe you, O ye of little faith?

This verse arouses, in most of us, an image of a field of white Madonna lilies, *L. candidum*. Perhaps we have gained this impression because the Madonna lily has been included in many paintings of the Madonna, the Annunciation and other phases of the life of Christ; but these paintings were made by artists who lived long after that period.

The Madonna lily has few or no adherents for a place among the Bible plants; most authorities believe it did not grow in the Holy Land at the beginning of the Christian era at all; and even though it grows there today, it is scarce.

The narcissus, the crocus, the amaryllis, the tulip, the iris are all common in Palestine today, but none of these lily-like plants is considered to be the "lily of the field." No doubt, Jesus referred to all the flowers of the field, among which were lilies; but the flower blooming in greatest profusion was the poppy anemone—*Anemone coronaria,* brilliant member of the Buttercup family. Its regal tints of scarlet, purple, blue, and gold could surely have prompted Jesus to say, "Solomon in all his glory was not arrayed like one of these."

The scarlet lily (*L. chalcedonicum*) is a native of Palestine but is so rare that it is seldom mentioned as a "lily of the field." It is generally accepted, however, as the lily of the SONG OF SOLOMON 5: 13:

> His cheeks are as a bed of spices, as sweet as flowers:
> His lips like lilies, dropping sweet smelling myrrh.

There was lily-work on the Temple of Solomon. It is described in I KINGS 7:19, 22, 26; but the general consensus of opinion is that the motif was furnished by waterlilies—both *Nymphaea alba* and *N. Lotus.*

> And the Chapiters that were upon the top of the pillars were of lily work in the porch, four cubits . . .
> And upon the top of the pillars was lily work . . .
> and the brim thereof was wrought like the brim of a cup, with flowers of lilies.

The "lily of the valleys" may have been the iris or the anemone or both, but *not* the plant popularly known to us as lily-of-the-valley. In SONGS 2:1, 2, the Bride says, "I am the rose of Sharon, and the lily of the valleys," and the Bridegroom answers, "As the lily among thorns, so is my love among the daughters." The rose of Sharon, as mentioned previously, is believed to be a flower with a bulbous root, and therefore probably a lily-like plant.

* * * *

Photograph by courtesy of the Bureau of Plant Industry, U.S D.A.

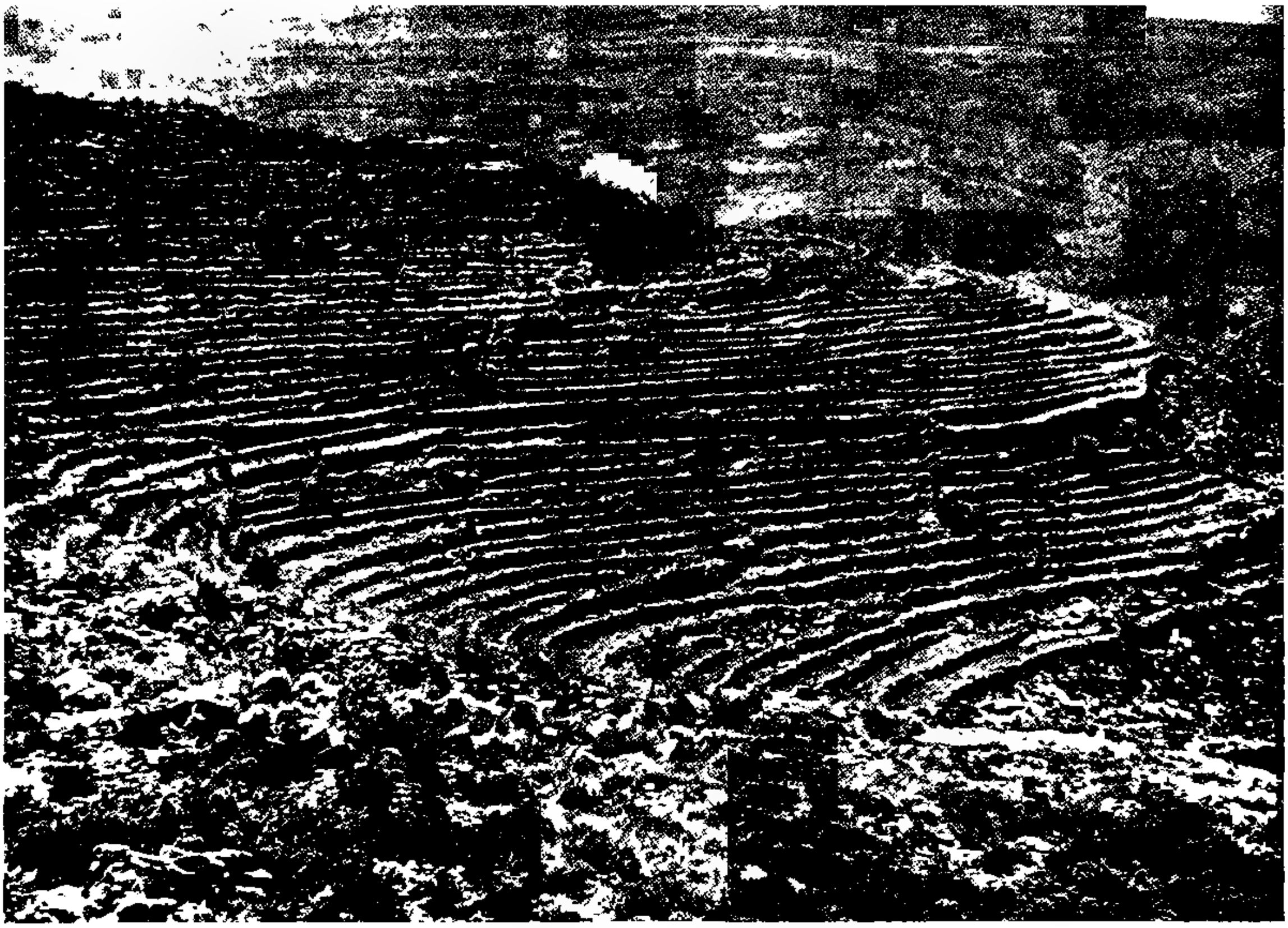
"Today in America we grow . . the olive . even as did those people who were making Bible history more than 4,000 years ago."

As controversial plants of the Bible, the thorns and thistles, nettles, briers, and brambles take their place. Early in Genesis the land is cursed with thorns and thistles. In GENESIS *3*:17, 18, the Lord said unto Adam:

> . . . cursed is the ground for thy sake; in sorrow shalt thou
> eat of it all the days of thy life; thorns also and thistles
> shall it bring forth to thee.

Plants with spiny growths are always characteristic of dry and desert regions. In the days when the Children of Israel tilled the soil, the spiny weeds were kept in abeyance, yet they were always there, lurking near the edge of the field, ready to enter if the farmer became slothful. In PROVERBS *24*:30-31, there is a description of what happens to the land of the indolent farmer:

> I went by the field of the slothful,
> And by the vineyard of the man void of understanding;
> And, lo, it was all grown over with thorns,
> The face thereof was covered with nettles,
> And the stone wall thereof was broken down.



Photograph by courtesy of W C Lowdermilk

*"The forests of olden times have been devastated, and the slopes are now exposed to the merciless beat and wash of the rain . . . the bare rocky hillsides are mute testimony to the truth that the laws of nature must be obeyed."**

The prophets, in their prophecies of doom and judgment, always mentioned the thorns and thistles, the nettles, briers, and brambles as part of the disaster that would befall the disobedient. Isaiah, in speaking of the Lord's destruction of all the nations, says in ISAIAH *34*:13:

> And thorns shall come up in her palaces, nettles and
> brambles in the fortresses thereof: and it shall
> be an habitation of dragons, and a court for owls.

There are so many spiny plants in Palestine today that it is almost impossible to choose from among them the plants that were likely to have been most noticeable in Bible days. Among those that have earned a place in the list, however, are the blackberry bramble, *Rubus sanctus;* the holy thistle, *Carduus Marianus* (*Silybum Marianum*); acanthus, *Acanthus syriacus;* the charlock, *Brassica arvensis;* nettles, *Urtica dioica* and *U.*

* "Before the hand of man exploited the magnificent forests, these Lebanon Mountains were covered with famous cedars, sought after by all the ancient world," writes Dr. W. C. Lowdermilk of the Soil Conservation Service of the U.S.D.A., who took the photograph shown here while he was in the Holy Land in 1939. "Man cut the forests and began cultivation, the rich humus soils soon began to wash away and the slopes showed forth their rocky skeleton. Some farmers began the long and difficult task of using the rocks of the fields for terraces, as in the central slope. Other farmers were too indifferent and their fields washed away until only thorns and skeleton rocks are left today, as seen on the slope in the foreground."

pilulifera; the jujube, *Zizyphus Spina-Christi,* and two buckthorns, *Rhamnus palaestina* and *Paliurus Spina-Christi,* the latter commonly grown today as Christ-thorn or Jerusalem thorn.

The two plants that are most popularly thought of as being the thorns of the Bible—the crown-of-thorns and the prickly-pear cactus—are definitely *not* in the list. Both of these have been introduced into the Holy Land in more recent years—the crown-of-thorns, *Euphorbia splendens,* from Madagascar, and the cactus, *Opuntia Ficus-Indica,* from America. Many an artist, visiting the Holy Land, has made pictures supposedly representing Biblical scenes, but including cacti. Every botanist knows that this plant is native to America and could not possibly have reached the Holy Land until after the discovery of the New World.

* * * *

Much of the "goodly land" that was covered with figs and olives and good green herbs has now been conquered by the weeds or, what is even worse, has become absolutely naked and barren. The forests of olden times have been devastated, and the terrace system, by which the ancients were able to keep the hillsides under cultivation, has fallen into decay, so that the slopes are now exposed to the merciless beat and wash of the rain. There is no soil left, so that in many places even the thorns and thistles of prophecy refuse to flourish; the bare, rocky hillsides are mute testimony to the truth that the laws of nature must be obeyed.

Rare Blue Amaryllis Blooms

THREE specimens of the rare blue amaryllis that is sometimes called the "Empress of Brazil", flowered in February at the New York Botanical Garden. They were on view for nearly three weeks in the Tropical Flower Garden in the Main Conservatories.

Seldom seen in cultivation anywhere, the blue amaryllis has been almost unknown in this country. The specimens, with three others, were obtained for the Garden by a member, Mr. Howard Eric of Stamford, Conn., who was obliged to carry on extensive correspondence with South America before he could find the bulbs and have them imported. So far as is known, no one has ever succeeded in raising the plants from seed (though they grow from seed in the wild) or in keeping the bulbs long in cultivation after they once have bloomed. The blue amaryllis, whose botanical name is *Hippeastrum procerum,* grows in only one spot in the world, mostly out of the cracks in precipitous cliffs of soft granite in the Organ mountains near Rio de Janeiro. Most of this plant's near relatives in the Amaryllis family bear red flowers, or white flowers marked with red.

Hippeastrum procerum, the blue amaryllis, three specimens of which bloomed at the Garden in early February.

The bulb of the blue amaryllis has a curious neck out of which the leaves and flowers spring. In the specimens at the Garden this neck is like a heavy brown trunk of dry silky texture, 20 inches high. In Brazil the neck has been reported to reach 5 feet in length.

The leaves, which always grow in two ranks out of opposite sides of the top of the neck, appear strap-shaped, but are actually somewhat sickle-shaped with translucent margins. The flowers of hyacinthine blue, each about the size of an Easter lily, grow in a dense cluster between the leaves.

Check-List Of Plants That Are Mentioned In The Bible

These names, which are based on the work of Dr. H. N. Moldenke, are alphabetized according to the form in which each occurs in the Bible. The word in brackets (like APRICOT *after* APPLE*) indicates the plant that is believed today to have been represented. Its botanical name follows, and after that, in parentheses, its present-day common name, if one exists in English. A quotation concludes each reference. In determining the botanical names, L. H. Bailey's Hortus has been followed for all plants that are known in cultivation in America; for the remainder, Engler & Prantl's Pflanzenfamilien has been taken as authority. Names that are starred are of plants being shown by the New York Botanical Garden at the 1941 International Flower Show in New York.*

Almonds. *PRUNUS (AMYGDALUS) COMMUNIS. GENESIS **45**: 11—Carry down the man a present, a little balm, and a little honey, spices, and myrrh, nuts, and almonds.

Algum trees. *JUNIPERUS EXCELSA (juniper). II CHRONICLES **2**: 8—Send me also cedar trees, fir trees, and algum trees.

Almug trees. PTEROCARPUS SANTALINUS (rosewood or red sandalwood). I KINGS **10**: 11-12—And the navy also of Hiram, that brought gold from Ophir, brought in from Ophir great plenty of almug trees, and precious stones.

Aloes (New Testament). *ALOE SUCCOTRINA. JOHN **19**: 39—And brought a mixture of myrrh and aloes.

Aloes (Old Testament). AQUILARIA AGALLOCHA (eaglewood) and SANTALUM ALBUM (sandalwood). PSALMS **45**: 8—All thy garments smell of myrrh, and aloes, and cassia.

Anise [dill]. *ANETHUM GRAVEOLENS. MATTHEW **23**: 23—Woe unto you, scribes and Pharisees, hypocrites; for you pay tithe of mint and anise and cummin, and have omitted the weightier matters of the law.

Apple [apricot]. *PRUNUS ARMENIACA. SONG OF SOLOMON **2**: 3—As the apple tree among the trees of the wood, so is my beloved among the sons.

Aspalathus. CONVOLVULUS FLORIDUS and C. SCOPARIUS. ECCLESIASTICUS **24**: 15—I gave a sweet smell like cinnamon and aspalathus.

Balm [balsam]. BALANITES AEGYPTIACA. JEREMIAH **8**: 22—Is there no balm in Gilead; is there no physician there?

Balm [balsam]. COMMIPHORA (BALSAMODENDRON) OPOBALSAMUM. EZEKIEL **27**: 17—they traded in thy market wheat of Minnith, and pannag, and honey, and oil, and balm.

Barley. *HORDEUM DISTICHON. DEUTERONOMY **8**: 8—A land of wheat, and barley, and vines, and fig trees, and pomegranates.

Bdellium. COMMIPHORA AFRICANA (BALSAMODENDRON AFRICANUM). GENESIS **2**: 12—And the gold of that land is good: there is bdellium and the onyx stone.

Beans. *VICIA FABA (FABA VULGARIS). EZEKIEL **4**: 9—Take thou also unto thee wheat, and barley, and beans, and lentiles, and millet, and fitches, and put them in one vessel, and make thee bread thereof.

Bitter herbs. *CICHORIUM ENDIVIA (endive), C. INTYBUS (chicory), *TARAXACUM OFFICINALE (dandelion), RUMEX ACETOSELLA var. MULTIFIDUS (sorrel). NUMBERS **9**: 11—eat it with unleavened bread and bitter herbs.

Box tree. *BUXUS LONGIFOLIA. ISAIAH **41**: 19—I will plant in the wilderness the cedar, the shittah tree, and the myrtle, and the oil tree: I will set in the desert the fir tree, and the pine, and the box tree together.

Briers. RUBUS SANCTUS and R. ULMIFOLIUS (blackberries), SOLANUM SANCTUM and S. SODOMOEUM (nightshade). ISAIAH **55**: 13 Instead of the thorn shall come up the fir tree, and instead of the brier shall come up the myrtle tree.—JUDGES **8**: 7—Then I will tear your flesh with the thorns of the wilderness and with briers.

Bulrushes. *CYPERUS PAPYRUS (papyrus). EXODUS **2**: 3—And when she could no longer hide him, she took for him an ark of bulrushes. .

Burning bush [crimson-flowered mistletoe]. LORANTHUS ACACIAE. EXODUS **3**: 2—And the angel of the Lord appeared unto him in a flame of the fire out of the midst of a bush: and he looked, and behold the bush burned with fire, and the bush was not consumed.

Calamus; sweet calamus; sweet cane. ANDROPOGON AROMATICUS. SONG OF SOLOMON **4**: 14—Spikenard and saffron; calamus and cinnamon, with all trees of frankincense.—JEREMIAH **6**: 20—To what purpose cometh there to me incense from Sheba and the sweet cane from a far country?

Camphire. LAWSONIA INERMIS (henna). SONG OF SOLOMON **4**: 13—Thy plants are an orchard of pomegranates, with pleasant fruits; camphire, with spikenard.

Cassia (of Exodus & Ezekiel). CINNAMOMUM CASSIA. EZEKIEL **27**: 19— . . bright iron, cassia, and calamus, were in thy market.

Cassia (of Psalms) [Indian orris]. SAUSSUREA LAPPA. PSALMS **45**: 8—All thy garments smell of myrrh, and aloes, and cassia.

Cedar. JUNIPERUS OXYCEDRUS and J. PHOENICIA (juniper). NUMBERS **19**: 6—And the priest shall take cedar wood, and hyssop, and scarlet, and cast it into the midst of the burning of the heifer.

Cedar; cedar of Lebanon. *CEDRUS LIBANOTICA. PSALMS **92**. 12—The righteous shall flourish like the palm tree: he shall grow like a cedar of Lebanon.

Chestnut [oriental plane]. *PLATANUS ORIENTALIS. GENESIS **30**: 37—And Jacob took him rods of green poplar, and of the hazel and chestnut tree.

Cinnamon. *CINNAMOMUM ZEYLANICUM. SONG OF SOLOMON **4**: 14—Spikenard and saffron; calamus and cinnamon, with all trees of frankincense.

Cockle. AGROSTEMMA GITHAGO (corn-cockle) or SOLANUM INCANUM (hoary nightshade). JOB **31**: 40—Let thistles grow instead of wheat, and cockle instead of barley.

Coriander. *CORIANDRUM SATIVUM. EXODUS **16**: 31 – . . . and it was like coriander seed, white; and the taste of it was like wafers with honey.

Corn [wheat]. TRITICUM AESTIVUM. GENESIS **41**: 57—And all countries came into Egypt to Joseph for to buy corn; because that the famine was so sore in all lands.

Cotton. [1]*GOSSYPIUM HERBACEUM. ESTHER **1**: 5-6 (Moffatt translation)—"When this was over he gave a banquet to all the men within the citadel of Susa, to high and low alike, for seven days, in the park belonging to the royal palace; there were hangings of white and violet cotton, corded with white and purple linen, caught up on silver rings and marble columns."

Cucumbers. *CUCUMIS SATIVUS and C. CHATE. NUMBERS **11**: 5—We remember the fish, which we did eat in Egypt freely; the cucumbers, and the melons, and the leeks, and the onions, and the garlick.

Cummin. CUMINUM CYMINUM. MATTHEW **23**: 23 - . . . for ye pay tithe of mint and anise and cummin.

Cypress. *CUPRESSUS SEMPERVIRENS var. HORIZONTALIS. ECCLESIASTICUS **50**: 10—And as a cypress tree which groweth up to the clouds.

Desire [caper]. CAPPARIS SICULA, or possibly C. SPINOSA. ECCLESIASTES **12**: 5—And when they shall be afraid of that which is high, and fears shall be in the way, and the almond tree shall flourish, and the grasshopper shall be a burden, and desire shall fail: because man goeth to his long home, and the mourners go about the streets.

Dove's dung [star-of-Bethlehem]. *ORNITHOGALUM UMBELLATUM. II KINGS **6**: 25—And there was a great famine in Samaria; and, behold, they besieged it until an ass's head was sold for four score pieces of silver, and the fourth part of a cab of dove's dung for five pieces of silver.

Ebony. *DIOSPYROS EBENASTER and D. MELANOXYLON. EZEKIEL **27**: 15— they brought thee for a present horns of ivory and ebony.

Fig. *FICUS CARICA. PROVERBS **27**: 18—Whoso keepeth the fig tree shall eat the fruit thereof.

Fir. *PINUS HALEPENSIS (Aleppo pine). ISAIAH **37**: 24—I will cut down the tall cedars thereof, and the choice fir trees thereof.

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[1]The word appears only in the Revised Version of the Bible, and is believed to have been correctly rendered by Moffatt in the quotation given here.

Fitches. NIGELLA SATIVA (fennel- or nutmeg-flower). ISAIAH **28**: 27—For the fitches are not threshed with a threshing instrument, neither is a cart-wheel turned about upon the cummin; but the fitches are beaten out with a staff, and the cummin with a rod.

Flax. *LINUM USITATISSIMUM. PROVERBS **31**: 13 & 24—She seeketh wool, and flax, and worketh willingly with her hands . . . She maketh fine linen and selleth it.

Frankincense. BOSWELLIA SERRATA (B. THURIFERA) or B. CARTERI (birdwood). SONG OF SOLOMON **3**: 6 Who is this that cometh out of the wilderness like pillars of smoke, perfumed with myrrh and frankincense, with all powders of the merchant?

Galbanum. FERULA GALBANIFLUA (a kind of fennel). EXODUS **30**: 34—Take unto thee sweet spices, stacte, and onycha, and galbanum; . .

Garlick. *ALLIUM SATIVUM and *A. ASCALONICUM (shallot). NUMBERS **11**: 5—We remember the fish, which we did eat in Egypt freely; the cucumbers, and the melons, and the leeks, and the onions, and the garlick.

The camphire of the Bible was Lawsonia inermis, the plant from which henna has been obtained for many centuries. A native of Egypt, it has been carried to many parts of the semi-tropical world. (Illustration from Blanco's Flora de Filipinas, Plate 108, Vol. 5.)

Gourd. CITRULLUS COLOCYNTHIS or *RICINUS COMMUNIS (castor-bean). JONAH **4**: 6—And the Lord God prepared a gourd, and made it to come up over Jonah, that it might be a shadow over his head, to deliver him from his grief. So Jonah was exceedingly glad of the gourd.

Green bay tree. *LAURUS NOBILIS (sweet bay). PSALMS **37**: 35—I have seen the wicked in great power, and spreading himself like a green bay tree.

Heath [Savin juniper]. JUNIPERUS SABINA. JEREMIAH **17**: 6—for he shall be like the heath in the desert.

Holm tree; mastic tree. [Lentisk]. PISTACIA LENTISCUS. SUSANNAH **54** (Goodspeed translation)—" 'So now if you saw this woman, tell us, under which tree did they meet?' He answered, 'Under the mastic tree'."

Husks [Carob-tree or St. John's bread]. *CERATONIA SILIQUA. LUKE 15: 16—And he would fain have filled his belly with the husks that the swine did eat: and no man gave unto him.

Hyssop [reed]. *HOLCUS SORGHUM. JOHN 19: 29— . . . and they filled a spunge with vinegar, and put it upon hyssop, and put it to his mouth.

Hyssop [marjoram]. ORIGANUM AEGYPTIACUM. I KINGS 4: 33—And he spake of trees, from the cedar tree that is in Lebanon even unto the hyssop that springeth out of the wall.

Ivy. *HEDERA HELIX. II MACCABEES 6: 7—And when the feast of Bacchus was kept, the Jews were compelled to go in procession to Bacchus carrying ivy.

Judas tree. [2]*CERCIS SILIQUASTRUM. MATTHEW 27: 5—And he cast down the pieces of silver in the temple, and departed and went and hanged himself.

Juniper [broom]. RETAMA RAETAM. I KINGS 19: 4—But he himself went a day's journey into the wilderness, and came and sat down under a juniper tree: . . .

Juniper roots. [3]CYNOMORIUM COCCINEUM. JOB 30: 4— . . and juniper roots for their meat.

Leeks. *ALLIUM PORRUM and TRIGONELLA FOENUM-GRAECUM (fenugreek). NUMBERS 11: 5—We remember the fish, which we did eat in Egypt freely; the cucumbers, and the melons, and the leeks, and the onions, and the garlick.

Lentiles. *LENS ESCULENTA. EZEKIEL 4: 9—Take thou also unto thee wheat, and barley, and beans, and lentiles, and millet, and fitches, and put them in one vessel, and make thee bread thereof.

Lilies [iris]. IRIS PALAESTINA. ECCLESIASTICUS 1: 8—And as the flower of roses in the spring of the year, as lilies by the rivers of waters, and as the branches of the frankincense tree in the time of summer.

Lilies. LILIUM CHALCEDONICUM (scarlet lily). SONG OF SOLOMON 5: 13— . his lips like lilies, dropping sweet smelling myrrh.

Lilies of the field. *ANEMONE CORONARIA [poppy, or St. Brigid, anemone] or ANTHEMIS PALESTINA. MATTHEW 6: 28—Consider the lilies of the field, how they grow.

Mallows [saltwort]. ATRIPLEX HALIMUS, also probably A. DIMORPHOSTEGIA, A. TATARICA and A. ROSEA. JOB 30: 4—Who cut up mallows by the bushes, and juniper roots for their meat.

Manna. LECANORA ESCULENTA and L. AFFINIS (lichens). EXODUS 16: 13—And when the dew that lay was gone up, behold, upon the face of the wilderness there lay a small round thing, as small as the hoar frost on the ground. And when the children of Israel saw it, they said one to another, it is manna.

Manna. NOSTOC (an alga which appears on the surface of the ground under moist conditions). EXODUS 16: 21—And they gathered it every morning, every man according to his eating: and when the sun waxed hot, it melted . . . And the House of Israel called the name thereof Manna.

Manna. TAMARIX MANNIFERA (tamarisk) and ALHAGI MAURORUM (camel-thorn) (incense-producing plants). BARUCH 1: 10— . . . and prepare ye manna, and offer upon the altar of the Lord our God.

Melons. *CUCUMIS MELO (muskmelon) and *CITRULLUS VULGARIS (watermelon). NUMBERS 11: 5—We remember the fish, which we did eat in Egypt freely; the cucumbers, and the melons, and the leeks, and the onions, and the garlick.

Mint. *MENTHA LONGIFOLIA and *M. ARVENSIS. MATTHEW 23: 23— . . for ye pay tithe of mint and anise and cummin, and have omitted the weightier matters of the law.

Mulberry [poplar]. POPULUS EUPHRATICA or P. TREMULA (aspen). II SAMUEL 5: 23— . . . but fetch a compass behind them, and come upon them over against the mulberry trees.

2"No discussion of the plants of the Bible could be complete," writes Dr. Moldenke in his survey of the plants of the Bible, "without at least a mention of the famous Judas tree." This tree (*Cercis siliquastrum*) has long been associated with Bible legends and traditions. In the Matthew verse quoted above it is not stated that Judas hanged himself on a tree, or, if so, on what kind of tree, but some legends have it that it was of this species, which is a native of Palestine. Other legends say it was a fig tree

3The actual reference is probably to the fungus, *Cynomorium coccineum*, which grows upon the roots of the "juniper" of the Holy Land.

Mustard. BRASSICA NIGRA. MARK 4: 31-32—It is like a grain of mustard seed, which, when it is sown in the earth, is less than all the seeds that be in the earth: But when it is sown, it groweth up, and becometh greater than all herbs, and shooteth out great branches.

Myrrh. COMMIPHORA (BALSAMODENDRON) MYRRHA and C. KATAF. PROVERBS 7: 17—I have perfumed my bed with myrrh, aloes, and cinnamon.—MARK 15: 23—And they gave him to drink wine mingled with myrrh.

Myrrh [fragrant gum]. CISTUS VILLOSUS (rock-rose), also var. CRETICUS, *C. SALVIFOLIUS, *C. VILLOSUS, and C. LADANIFERUS (ladanum). GENESIS 37: 25—A company of Ishmaelites came from Gilead with their camels, bearing spicery and balm and myrrh, going to carry it down to Egypt.

Myrtle. *MYRTUS COMMUNIS. ZECHARIAH 1: 8—I saw by night, and behold a man riding upon a red horse, and he stood among the myrtle trees that were in the bottom.

The 'rolling thing' which has come to be known as the "rose of Jericho" or "resurrection plant" is this tumbleweed of the Holy Land, Anastatica hierochuntica. In autumn the plant becomes light and dry and is rolled about by the wind. (From Plate 4400, Vol. 74, 1848)

Illustrations from Curtis's Botanical Magazine.

"Solomon in all his glory was not arrayed like one of these." Poppy anemones, with their flowers of red, blue, gold, and white, are believed to have been the Biblical "lilies of the field." They are among the most common wild flowers of the Holy Land. (From Plate 841, Vol. 22, 1805)

Nettles. *URTICA DIOICA and U. PILULIFERA; also ACANTHUS SYRIACUS or possibly *A. SPINOSUS (acanthus) and *BRASSICA ARVENSIS (charlock). PROVERBS **24**: 31—And, lo, it was all grown over with thorns, and nettles had covered the face thereof.

Nuts. *JUGLANS REGIA (walnut). SONG OF SOLOMON **6**: 11—I went down into the garden of nuts to see the fruits of the valley.

Nuts. *PISTACIA VERA (pistachio). GENESIS **43**: 11—Carry down the man a present, a little balm, and a little honey, spices, and myrrh, nuts, and almonds.

Oak. QUERCUS AEGILOPS. ISAIAH **44**: 14—He . . taketh the cypress and the oak.

Oak. QUERCUS ILEX. GENESIS **35**: 8— . . and she was buried beneath Beth-el under an oak.

Oak. QUERCUS COCCIFERA and Q. LUSITANICA. ZECHARIAH **11**: 2— . howl, O ye oaks of Bashan.

Oak. QUERCUS PSEUDOCOCCIFERA. I KINGS **13**: 14— . . and found him sitting under an oak.

Oil tree. [oleaster]. *ELAEGNUS ANGUSTIFOLIA. ISAIAH **41**: 19—I will plant in the wilderness the cedar, the shittah tree, and the myrtle, and the oil tree.

Olive. *OLEA EUROPAEA. DEUTERONOMY **28**: 40—Thou shalt have olive trees throughout all thy coasts, but thou shalt not anoint thyself with the oil; for thine olive shall cast his fruit.

Onions. *ALLIUM CEPA. NUMBERS **11**: 5—We remember the fish, which we did eat in Egypt freely; the cucumbers, and the melons, and the leeks, and the onions, and the garlick.

Onycha. CISTUS LADANIFERUS (ladanum), or perhaps STYRAX BENZOIN (benzoin). ECCLESIASTICUS **24** 15—A pleasant odour like the best myrrh, as galbanum, and onycha, and sweet storax.

Palm. *PHOENIX DACTYLIFERA (date-palm). II CHRONICLES **28**: 15— . and brought them to Jericho, the city of palm trees.

Pannag [millet]. PANICUM MILIACEUM. EZEKIEL **27**: 17— . they traded in thy market wheat of Minnith, and pannag, and honey, and oil, and balm.

Pine. PINUS HALEPENSIS var. BRUTIA, also PINUS PINEA (stone pine), *ABIES CILICICA (Cilician fir), and JUNIPERUS DRUPACEA and J. MACROCARPA (junipers). ISAIAH **60**. 13 The glory of Lebanon shall come unto thee, the fir tree, the pine tree, and the box together, to beautify the place of my sanctuary.

Pomegranate. *PUNICA GRANATUM SONG OF SOLOMON **4**: 13—Thy plants are an orchard of pomegranates, with pleasant fruits.

Poplar. POPULUS ALBA. GENESIS **30**: 37—And Jacob took him rods of green poplar.

Reed. *ARUNDO DONAX and PHRAGMITES MAXIMUS. JOB **40**: 21—He lieth under the shady trees, in the covert of the reed, and fens.

Reed. HOLCUS SORGHUM. MARK **15**: 36—And one ran and filled a spunge full of vinegar, and put it on a reed, and gave him to drink.

Rolling thing ("Rose of Jericho"). ANASTATICA HIEROCHUNTICA (resurrection plant). ISAIAH **17**: 13 . . . they shall flee far off, and shall be chased as the chaff of the mountain before the wind, and like a rolling thing before the whirlwind.—ECCLESIASTICUS **24**: 14— . . . rose plant in Jericho.

Rose [narcissus]. *NARCISSUS TAZETTA. ISAIAH **35**: 1—The wilderness and the solitary place shall be glad for them; and the desert shall rejoice, and blossom as the rose.

Rose [oleander]. *NERIUM OLEANDER. ECCLESIASTICUS **39**: 13—Hearken unto me, ye holy children, and bud forth as a rose growing by the brook of the field.

Rose. ROSA PHOENICIA. II ESDRAS **2**: 19—And seven mighty mountains whereupon there grow roses and lilies, whereby I will fill their children with joy.

Rose of Sharon [tulip]. TULIPA MONTANA or T. SHARONENSIS. SONG OF SOLOMON **2**: 1—I am the rose of Sharon, and the lily of the valleys.

Rue. *RUTA GRAVEOLENS. LUKE **11**: 42—But woe unto you, Pharisees! for ye tithe mint and rue and all manner of herbs.

Rush. SCIRPUS LACUSTRIS or JUNCUS EFFUSUS. JOB **8**: 11—Can the rush grow up without mire? can the flag grow without water?

Rie [rye]. TRITICUM AESTIVUM var. SPELTA (spelt). EXODUS **9**: 32—But the wheat and the rie were not smitten; for they were not grown up.

Saffron. *CROCUS SATIVUS. SONG OF SOLOMON **4**: 14—Spikenard and saffron, calamus and cinnamon, with all trees of frankincense.

Scarlet [oak][4]. QUERCUS COCCIFERA. LEVITICUS **14**: 51—And he shall take the cedar wood, and the hyssop, and the scarlet.

Seven-branched candlestick [sage plant]. SALVIA JUDAICA.[5] EXODUS **37**: 18—And six branches going out of the sides thereof; three branches of the candlestick out of one side thereof, and three branches of the candlestick out of the other side thereof.

The sycomore (not sycamore) of the Bible was a species of fig, Ficus Sycomorus. (Illustration from Plate 38 of Vietz, Medizinisch-oekonomisch-technichen Pflanzen, Supplement, 1822.)

Shittim (or shittah). ACACIA SEYAL and A. TORTILIS. EXODUS **25**: 10—And they shall make an ark of shittim wood.

Sope [soap]. SALSOLA KALI (saltwort) and SALICORNIA FRUTICOSA (glasswort), the ashes of which, after burning, were used for making soap. JEREMIAH **2**: 22—For though thou wash thee with nitre, and take thee much sope, yet thine iniquity is marked before me.

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[4]The scarlet dye used in Biblical days was made from an insect, *Coccus ilicis,* which infests this oak species.

[5]This plant is included here because it is believed that the Hebrews derived the design of their golden candlestick directly from the form of this plant.

Spices. ASTRAGALUS GUMMIFER and A. TRAGACANTHA are probably referred to, though many other plants with pungent flavor may have been meant. GENESIS **43**: 11—Carry down the man a little present, a little balm, and a little honey, spices, and myrrh, nuts, and almonds.

Spikenard. NARDOSTACHYS JATAMANSI. MARK **14**: 3—And being in Bethany in the house of Simon the leper, as he sat at meat there came a woman having an alabaster box of ointment of spikenard very precious.

Stacte [sweet storax]. STYRAX OFFICINALIS. EXODUS **30**: 34—And the Lord said unto Moses, Take unto thee spices, stacte, and onycha, and galbanum.

Strange vine. AMPELOPSIS (VITIS) ORIENTALIS. JEREMIAH **2**: 21—Yet I had planted thee a noble vine, wholly a right seed: how then art thou turned into a degenerate plant of a strange vine to me?

Sweet cane [sugar cane]. *SACCHARUM OFFICINARUM. ISAIAH **43**: 24—Thou hast bought me no sweet cane with money. (See also Calamus.)

Sycamine [black mulberry]. *MORUS NIGRA. LUKE **17**: 6—If ye had faith as a grain of mustard seed, ye might say unto this sycamine tree, Be thou plucked up by the roots, and be thou planted in the sea; and it should obey you.

Sycomore. [6]*FICUS SYCOMORUS. PSALMS **78**: 47—He destroyed their vines with hail, and their sycomore trees with frost.

Tares [rye-grass]. *LOLIUM TEMULENTUM. MATTHEW **13**: 24-30— . . But while men slept, his enemy came and sowed tares among wheat, and went his way.

Teil tree, turpentine tree. PISTACIA TEREBINTHUS. ISAIAH **6**: 13— . as a teil tree, and as an oak, whose substance is in them.—ECCLESIASTICUS **24**: 16— . . as the turpentine tree, I stretched out my branches.

Thistles. *CARDUUS MARIANUS (SILYBUM MARIANUM) (holy thistle); also CENTAUREA CALCITRAPA and C. VERUTUM. HOSEA **10**: 8—The thorn and the thistle shall come up on their altars.

Thorns. PALIURUS SPINA-CHRISTI (Christ or Jerusalem thorn). MATTHEW **27**: 29— . . . and when they plaited a crown of thorns, they put it upon his head.

Thorns. RHAMNUS PALAESTINA (buckthorn). PROVERBS **15**: 19—The way of the slothful man is as an hedge of thorns.

Thorns [jujubes]. ZIZYPHUS SPINA-CHRISTI and Z. VULGARIS. MATTHEW **7**: 16—Ye shall know them by their fruits. Do men gather grapes of thorns, or figs of thistles?

Thyine wood. TETRACLINIS ARTICULATA (CALLITRIS QUADRIVALVIS) (arar tree, an arborvitae relative). REVELATION **18**: 12—The merchandise of gold, and silver, and precious stones, and of pearls, and fine linen, and purple, and silk, and scarlet, and all thyine wood, and all manner vessels of ivory.

Tree [tamarisk]. TAMARIX PENTANDRA, T. TETRAGYNA, or T. ARTICULATA. I SAMUEL **22**: 6— . . . now Saul abode in Gibeah under a tree in Ramah.

Vine. *VITIS VINIFERA. JUDGES **9**: 12-13—Then said the trees unto the vine, Come thou, and reign over us. And the vine said unto them, Should I leave my wine, which cheereth God and man, and go to be promoted over the trees?

Waterlily. *NYMPHAEA ALBA, *N. LOTUS and *N. CAERULEA. I KINGS **7**: 19, 22, & 26—And the chapiters that were upon the top of the pillars were of lily work in the porch, four cubits . . . and the brim thereof was wrought like the brim of a cup, with flowers of lilies.

Weeds [seaweeds]. ZOSTERA MARINA. JONAH **2**: 5—The waters compassed me about, even to the soul: the depths closed round about, the weeds were wrapped about my head.

Wheat. *TRITICUM AESTIVUM. JUDGES **6**: 11— . . and his son Gideon threshed wheat by the wine-press, to hide it from the Midianites.

Willow. SALIX ALBA, S. CINEREA, *S. FRAGILIS, and S. SAFSAF. ISAIAH **44**: 4—And they shall spring up as among the grass, as willows by the water courses.

Willow [poplar]. POPULAS EUPHRATICA. PSALMS **137**: 2—We hanged our harps upon the willows in the midst thereof.

Wormwood. ARTEMISIA JUDAICA or *A. ARBORESCENS. JEREMIAH **23**: 15—Behold, I will feed them with wormwood, and make them drink the water of gall.

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[6]Not *sycamore*, which is another name for the native American plane-tree.

*Relation Of The Herbarium To Horticultural Progress**

By E. J. Alexander

THE PRIMARY PURPOSE of gardening of course is to grow plants well. But every garden takes on additional significance when the gardener knows the names of the plants he is growing. It is not enough to say that one shrub is a rhododendron and another a barberry, for in northern regions such as ours, where many species are not winter-hardy, it is necessary to know whether that rhododendron, for instance, be *Rhododendron catawbiense,* which, being native in the higher southern Appalachians, is thoroughly hardy, or whether it be *Rhododendron californicum,* to which a northern climate is not so friendly.

At an institution like The New York Botanical Garden, where dealing with both wild and cultivated plants is an everyday job, it is of even greater importance that every plant handled be identified as correctly as possible. In the course of identification of this cultivated material, it is vitally necessary to have reference to herbarium material from all parts of the world.

The Botanical Garden obtains the many new plants it grows from several sources: from seeds, bulbs or roots which are collected in the wild by explorers; from seeds which are received through exchange with other similar institutions; by gift from amateurs; and by gift or purchase from commercial growers. In none of these cases can the names assigned them by the senders be accepted without question. It is too often possible that the person who named them did not have access to herbarium material with which to verify his identification. This would be all the more probable if the printed descriptions were inadequate, or if there were not available for comparison herbarium specimens collected from wild plants in the country of origin.

As to inadequate descriptions, there are a number of plant characters, such as habit of growth; form of inflorescence and flower; shape, appearance and structure of fruit; texture of leaves and stem, and other minor points, which can seldom be adequately described in words, but which are of great necessity in identification of living material. In these cases one good herbarium specimen is of more value than all the words ever written to describe the plant.

It was, in fact, this inadequacy of words to convey characters perceptible only to the visual senses that led in the beginning to the making of herbarium specimens from cultivated material raised from wild collected seed. Plants are very likely to change considerably under cultivation, so that these specimens would have to be made from the first plants grown before any great change had taken place. Since descriptions of many species were made by early botanists from such cultivated plants, it was vastly important that herbarium specimens be made from those same plants, in order to preserve the necessary characters. Occasionally this was not done, and since some of the plants were subsequently lost to cultivation, we are today faced with great doubt as to their identity. Present-day collectors back up their introductions with herbarium specimens so that no more of this uncertainty is likely to occur.

In obtaining new plants for introduction to horticulture the herbarium again is of great importance. We receive many seed-exchange lists from institutions in all parts of the world. Since seeds are listed only by botanical name, specimens of the plants concerned must be consulted, and it is only by recourse to herbarium specimens that we can determine whether a plant is worthy of horticultural attention.

The occasion may arise that someone wishes to give a plant of unknown name or source to the Garden. That plant must be identified before it is possible to know whether it is suitable or desirable for horticultural purposes. If the plant be a young one, in order to name it properly, leaf-texture, stem-texture, and habit of growth must be used for identification. These characters, coupled with the more

* This is one of the addresses given at the Garden Dec. 11, 1940, when the 2,000,000th specimen was incorporated into the herbarium.

decisive ones of flower and fruit, may only be obtained by herbarium consultation.

Frequently collectors in various countries wish to know what plants from their region would be acceptable or desirable as garden subjects. Without recourse to herbarium material, such an inquiry could not be answered.

When expeditions go out to obtain horticultural subjects they do not go blindly into an area. The herbarium must be consulted in advance, and lists made of those plants that show horticultural promise. Localities in which those plants have been found must also be listed, otherwise one might spend hours, days, weeks or even months searching in vain in the wrong area.

A fact that must be realized is that all cultivated plants were originally wild in some part of the world, and while they have now been more or less altered by cultivation, good herbarium material of the wild stock furnishes a basis for the correct interpretation of confused groups.

It is significant that the institutions which have made the greatest contributions to the horticultural world are those which themselves have maintained the largest collections of living plants, and which have the largest herbaria from which to draw information. Without those herbaria the knowledge as to what plants could be obtained in any region, as well as what regions could be most profitably explored from the horticultural standpoint, would not be possible. Such a situation would set horticultural progress back to its beginning days.

All of these things must be taken into consideration to sum up the value of the herbarium in horticultural progress, for without it new garden subjects would be much less frequent, and identification would have a very low percentage of accuracy.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

For Student and Teacher With Microscope

ELEMENTS OF BOTANICAL MICROTECHNIQUE. John E. Sass. 222 pages, illustrated and indexed. McGraw-Hill, New York, 1940. $2.50.

This is essentially a manual for a course in botanical microtechnique. It includes charts of procedure, formulae, and detailed directions for a series of laboratory exercises. The first 12 chapters take us through the standard methods of collection, killing, fixing, embedding, sectioning, and staining. The second part treats of the "specific methods" appropriate to the different groups of plants. The material and procedures are chosen with a view to the needs of prospective teachers and graduate students, the presentation is simple and clear, and the book will doubtless be useful in many colleges and universities. Its only fault is one that is inherent in such a manual: it is difficult to know what to omit, and many teachers may find that their pet methods have been slighted. The smear method, for instance, is accorded only one page and is introduced with what is almost an apology for its inclusion. It is hard to know where to draw the line between the most elementary manual and an inclusive reference work. A similar criticism may be directed at the useful chapter on the microscope The problem of illumination is treated without reference to the color of the light or to the use of filters. The numerical aperture of the Abbe condenser is misleadingly given as about 1.25; if it is worth while (as it certainly is) to go into the question of aperture, the student should learn what the actual working aperture of his microscope may be. In short, this little book is so good that it should be larger, and it is to be hoped that a future edition will remedy some of the more obvious omissions.

H. W. RICKETT.

Geology, Food, and Civilization

ECONOMIC ANNUALS AND HUMAN CULTURES. Oakes Ames. 153 pages, illustrated and indexed. Botanical Museum of Harvard University, Cambridge, Mass. 1940. $4.

An excellent and original book on economic botany. It is divided into five parts, which include a discussion on the significance of the angiosperm seed, the important relationship to civilization of the plant which seeds itself annually, and tables correlating the antiquity of food plants with the geological time chart. The final section is devoted to the more important economic annuals with a complete text on the history and use of each species.

G. L. WITTROCK.

A Wealth of Lore on Herbs

GREEN ENCHANTMENT. Rosetta E. Clarkson. 328 pages, illustrated and indexed. Macmillan, New York, 1940. $3.

In this volume, rich in content and well written, the author has provided a worthy contribution to our ever increasing literature on herbals and on the customs and beliefs of peoples in Europe before a proper understanding of plants had begun to develop. It traces the cultivation of plants from purely utilitarian purposes in the old physic gardens to our wholly esthetic concept of gardens, and in so doing presents a wealth of information on the favorite herbs of olden days, on blossoms that were used in food and medicine, and even on recipes for making salads. Some of the chapters are so laden with information that they are almost statistical in content and difficult to read, while others are more entertaining, as those on "The Witches' Garden" and "Herbs That Never Were."

To have buried this valuable compendium of information under so ambiguous a title as the author has selected, is unfortunate indeed. Scholars interested in the subject matter are very apt to overlook the volume and the author to miss a good part of the audience she has so diligently worked for. "Green Pastures," a drama, might have been a manual on range management, so far as its title was concerned, but the world lost nothing by that titular concealment. "Green Enchantment," on the other hand, might be a study in sorcery, and who among gardening bibliophiles would pause to examine it? Books are not everywhere classified according to subject matter. More appropriate titles might have been "The Herbalists and Their Times" and "Gardening and Plant Lore in Mediaeval-Modern Europe." Admittedly less alluring than "Green Enchantment," these titles would be more informative, and more than titular allurement is necessary to induce one to read this really informative volume.

E. H. FULLING

Out of China

CHINESE HOUSES AND GARDENS. Henry Inn. 45 pages of text, 242 illustrations. Fong Inn's Ltd. Honolulu. 1940. $5.

Here is a welcome addition to the all too meager bibliography on Chinese gardens. In handsome format, this book contains much source material, valuable to the student of design. The articles, photographs, and line drawings are all done by Chinese scholars—thus do we have the eastern point of view. Specially stressed are such architectural details as walls, windows, doorways, courtyard paving, and the ever-present rock formations.

Those of us who know the beauty of China, when peach, plum and peony grace the courtyard gardens, may wish that Mr. Inn had not taken the majority of his photographs during the winter months. Emphasis lies primarily in the motifs of structural design — man made. The modernist seeking new ideas may find them here in ancient China.

HARRIET K. MORSE.

Honduran Adventure

JUNGLE IN THE CLOUDS. Victor Wolfgang von Hagen. 260 pages, illustrated with photographs. Duell, Sloan & Pearce, New York, 1940. $3.

In this account of modern exploration, Dr. von Hagen details the story of how he and his wife penetrated the mountain forest of Honduras and brought out the first quetzal birds ever to be transported from their jungle habitat to captivity in a temperate climate. In thus breaking the tradition of centuries, the von Hagens not only accomplished a difficult feat, but in-

cidentally they explored a little-known part of Central America, lived with an "extinct" tribe of Jicaque Indians, and examined with scientific thoroughness the Maya ruins at Copán.

The story is told in Dr. Von Hagen's usual entertaining and lucid manner. For the reader interested in a picture of the vegetation, the most instructive part of the book will probably be that which deals with the cloud forest of Honduras, the home of the quetzals. In this section the author describes the country, the Jicaques, and the habits of the quetzal in fascinating detail. Numerous photographs illuminate the book.

A. C. SMITH,
Arnold Arboretum.

Second Printing

APPLIED MYCOLOGY AND BACTERIOLOGY. L. D. Galloway and R. Burgess. 186 pages, illustrations, index. Chemical Publishing Company, New York. 1940. $4.

In its second printing, this volume is essentially identical with its predecessor. A few minor additions have been made which do not appreciably increase the value of the text. These additions are in the form of four illustrations and a few added references in the bibliography at the end of some of the chapters. The reviewer feels that such changes as have been made are more than offset by the use of a poorer quality of paper in the second printing.

For a review of the first edition the reader is referred to the March 1940 issue of this Journal.

THOMAS LASKARIS.

In Verse and Prose

TEXAS WILD FLOWER LEGENDS. Nancy Richey Ranson. 119 pages, illustrated. The Kaleidograph Press, Dallas, Texas. Second edition, 1940. $1.50.

Mrs. Ranson has collected her poems which have been published in numerous magazines and newspapers and has added to them a page or so of legend about each of nearly half a hundred wild flowers of Texas and their relatives. The book deserves better illustrations than the coarse newspaper cuts which the publisher evidently borrowed.

CAROL H. WOODWARD.

Properties of Latex

RUBBER LATEX. Henry P. Stevens and W. H. Stevens. 224 pages, illustrated and indexed. Chemical Publishing Co., New York. 1940. $2.

This is the fourth edition of what was originally a pamphlet written to supply information as to the properties of latex to the firms and individuals who wished to experiment with latex supplied them by the Rubber Growers' Association. The first 89 pages are devoted to light chapters on the production and properties of latex, and to methods for manufacturing from latex. The rest of the book (135 pages) gives short abstracts of British patents obtained since 1920, index to the text, index of patents, and index of patentees. Early in the 19th century attempts were made to make rubber articles from latex. The attempts failed because the latex could not be shipped without decomposing. In 1853 Mr. Lee Morris of New York obtained a license in France for a method of preserving latex by the addition of strong ammonia water. The same method is the one most used today.

FREDERICK W. KAVANAGH.

For the Children

A BOOK OF GARDEN FLOWERS. Edith Farrington Johnston & Margaret McKenny. 72 pages, illustrated and indexed. Macmillan, New York. 1941. $2.

This is a book primarily for children, a companion to A Book of Wild Flowers published in 1939 and so well received by the public. Its purpose is, through reading and pictures, to acquaint children with flowers. Those that are common in the average American home garden are classified according to their season of bloom and each one is illustrated by a full-page color-lithograph. These are little gems, both artistically and accurately executed by Mrs. Johnston. On the opposite page the seed-pods are pictured. Miss McKenny's text describes the flowers and seeds, gives some practical gardening hints, tells where the flowers originated, and gives some historical fact or legend about each. A list of the botanical names (for the more inquiring child) concludes the book.

THEA M. GLEASON.

Current Literature At a Glance*

Britton Cottage. The story of the Britton Cottage at New Dorp, Staten Island, which was occupied by Nathaniel Britton in 1695 and eventually lived in by Nathaniel Lord Britton, first Director-in-Chief of the New York Botanical Garden, is told in the Proceedings of the Staten Island Institute of Arts and Sciences published last fall. Drawings and photographs show the development of the cottage from the time it was first built in 1675 to the present day. In 1915, Dr. Britton, who in the 1890's is said to have written much of his "Illustrated Flora of the Northern United States and Canada" by the attic window of the house, deeded the place to the institute as an example of early colonial cottage architecture.

Azalea Spot. Bees are largely blamed for carrying the disease which in 1931 damaged hundreds of thousands of flowers on the azaleas at the height of their bloom near Charleston, S. C. Overnight the great display, which had attracted many travelers, appeared ruined. Since then the disease, which is caused by a hitherto unknown fungus, has appeared in other sections of the South. Government investigations of its cause and control are reported by Freeman Weiss and Floyd F. Smith in Circular 556 of the U.S.D.A. Control of the guilty insects and also cleaning up of debris and surface soil around the plants in the fall are recommended.

Insecticide. A Chinese relative of our native bittersweet (*Celastrus scandens*) has been recently introduced into the United States by the Bureau of Plant Industry for use of the powdered roots as an insecticide. The plant (*Tripterygium Wilfordii*) has long been used in China for this purpose, and government tests are now being made on its applicability here. So far, it has been shown most effective against cabbage worms and codling-moths, according to Walter T. Swingle, who gives a preliminary report in *Science* for Jan. 17.

* All publications mentioned here—and many others—may be found in the Library of the Botanical Garden, in the Museum Building.

Santa Barbara. Formerly known as the Blaksley Botanic Garden, the institution established in 1926 by the Santa Barbara Museum of Natural History is now called the Santa Barbara Botanical Garden. An attractive booklet issued last year by the Director, Maunsell van Rensselaer, describes the 30 acres containing examples of forest, woodland, foothills, meadow, chaparral, desert, canyon, and arroyo. The garden, which is being developed on land purchased and presented to the museum by Mrs. William H. Bliss as a memorial to her father, Henry Blaksley, is to be devoted to native California trees, shrubs, and flowers. One of its features is a splendid collection of *Ceanothus,* sometimes known as "California lilac."

Bramble Fruits. How to grow raspberries, blackberries, and dewberries is told in Circular 508 of the Illinois Agricultural Experiment Station. A well illustrated booklet of 72 pages, the publication outlines complete care of the plants not only throughout the year, but for subsequent years after planting in order to maintain high production.

Plant Diseases. For the West Coast gardener the California Agricultural Extension Service has issued a circular (No. 118) entitled "Diseases of Flowers and Other Ornamentals," under the authorship of Ralph E. Smith. The concluding section is devoted to fungicides and their preparation.

Cacti. For many years it was believed that every cactus in the United States was known to botanists, but the December issue of the *Cactus and Succulent Journal* contains the description of a new genus, *Coloradoa,* a globose type found growing at the foot of the Mesa Verde, near Cortez, Col. The type species has been named *C. mesae verdae* by its discoverers, C. H. Boissevain and Carol Davidson.

Supplementing Rainfall. How to irrigate land which has a fair amount of rainfall, yet not quite enough at all seasons to insure good crops, is explained by F. E. Staebner in Farmers' Bulletin 1846 of the U. S. D. A. Drawings, charts, and photographs amplify the text, and complete descriptions of needed equipment are given.

Notes, News, and Comment

Courses. Registration for the Garden's new ***Three-day Short Course in Practical Gardening***, to be given May 5, 6, and 7, must be completed by April 15. This course, which was first announced in the Journal last September, will provide three half-day sessions of lectures in the fundamentals of gardening and three of practical work by members of the class under the supervision of a group of six professional gardeners. The fee for the three days of concentrated training is $15. Annual members of the Garden who are not taking another course this year will need to pay only the $5 which exceeds their membership fee. The course is fully outlined in the Educational Program, a copy of which will be sent without cost to anyone who requests it.

Garden Appreciation, the course of study inaugurated last spring under the direction of Dr. H. W. Rickett, with the assistance of T. H. Everett, will be repeated this year, commencing April 1 and continuing for 12 consecutive Tuesday afternoons at 3:30. Further details of this are also given in the Educational Program. The fee is $10.

Saturdays. The opening lectures of the spring series on Saturday afternoons at the Garden will be "Orchids of Our Northern Woods" by Dr. Frederick H. Pough of the American Museum of Natural History, Mar. 22; "First Families Among the Flowers" by Dr. H. W. Rickett, Mar. 29; "Rocky Mountain Wild Flowers" by Solomon Friedland, representing the New York Association of Biology Teachers, April 5; and "Springtime Jaunts Outside the City" by E. J. Alexander, April 12. The complete program will be announced in the April Journal.

Microscopical. Among the exhibits at the annual show of the New York Microscopical Society at the American Museum of Natural History Feb. 8 were a collection of photographs of diatoms and diatomists from the New York Botanical Garden, presided over by Rosalie Weikert, and recent copies of the Journal (Dec. 1940 and Jan. 1941) containing material on diatoms, in charge of Carol H. Woodward. Joseph H. Burke presented an action exhibit at which visitors attempted to lift and move diatoms with a mounting hair under a low-power microscope.

Phi Beta Kappa. Dr. William J. Robbins represented Lehigh University, from which he was graduated in 1910, at the national dinner of Phi Beta Kappa in New York Feb. 18.

Conference. Dr. Sutton Redfern, research chemist at the Fleischmann laboratories, addressed the monthly conference of the scientific staff and registered students of the Garden Feb. 14. He used a motion picture to demonstrate the application of time lapse photography to a study of the degredation of wheat starch by amylase.

Lectures. The Home Garden Club of Morristown, N. J., one of the Affiliates of the New York Botanical Garden, heard a lecture Feb. 5 by Dr. A. B. Stout on "Lilies for Gardens." Other addresses recently given by members of the staff include the following: "Scenery and Gardens in Bermuda" by Dr. F. J. Seaver, Torrey Botanical Club, Feb. 4; "Dirt Gardening" by T. H. Everett, Sasqua Garden Club Feb. 5; "Rare Plants at the Garden" before the Advisory Council Feb. 10; "Rubbers" before the Nassau County Horticultural Society Feb. 12; and "If I Had a Small Garden" Jan. 8 before the Greenwich Garden Club, all by T. H. Everett. Dr. W. H. Camp addressed the Plant Science Seminar at Rutgers University Feb. 13, and Elizabeth C. Hall spoke briefly on books on herbs before the City Gardens Club Feb. 24.

Visitors. Among February visitors at the Garden were James R. Bartholomew of the Farlow Herbarium; Ruth Patrick and Claire B. Myers of the Academy of Natural Sciences, Philadelphia; D. A. McLarty of Dartmouth; Frans Verdoorn of Waltham, Mass.

Nut Breeding. Dr. Robert T. Morris of Stamford, Conn., who has been a member of the Corporation of the Garden for many years and who has long been known for his work in the culture and breeding of nut trees, in a recent letter to the Garden suggests the crossing of the "English" walnut, which is seldom hardy north of Delaware, with the butternut, which is hardy in Maine. "Were I not past 80 years of age," he writes, "I would do a lot of experimenting in a field of so much promise."

THE NEW YORK BOTANICAL GARDEN

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Robert H. Fife, Chairman; Mrs. Elon Huntington Hooker, First Vice-chairman; Mrs. Carl A. de Gersdorff, Second Vice-chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; ind Mrs. F. Leonard Kellogg, Treasurer.

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SECTION ONE
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CAROL H WOODWARD, Editor
April 1941

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AN ESSENTIAL OF LIFE

Daffodils are flowering at Kew again this spring as gaily as though there were no war A recent report from the Royal Botanic Gardens of England stated: "Although the glass has suffered appreciable damage as a result of enemy action , little harm has been done to the plant collections." So undoubtedly, over the holidays and week-ends, crowds of people are, as always, enjoying the acres of bloom, the beautiful gardens, and the sheltering green trees, finding greater solace and more deep-felt joy there now than in times when life was less disturbed.

On this side of the Atlantic, in this relatively secure and peaceful country, it is noticed that in times of stress the people make the greatest use of their parks, adjacent woodlands, and such plantings as are found in a botanical garden. To contemplate growing plants in a pleasing, well ordered setting fulfills an emotional need as no other experience can do. It appeases the troubled mind, calms the excited one, stimulates the moody, and augments the joy of the contented.

Gardens are essential under all circumstances of life. The plantings at a public botanical garden are a manifestation of an indispensable means for providing peace of mind, pleasure, and relief from tension. They renew our faith in the permanent satisfactions and encourage us to regard present conditions as but temporary derangements in a better and more useful way of life.

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Hybrid Peonies

By A. P. Saunders

Dr. Saunders, who was retired two years ago from his post as Professor of Chemistry at Hamilton College, Clinton, N. Y., is one of the country's leading breeders of peonies. He tells here something of the history of peony breeding in the Western Hemisphere, bringing the story up to date with reports on some of his own most recent hybrids. On May 31, Dr. Saunders will close the spring series of Saturday lectures at the Botanical Garden by speaking on "Hybrid Peonies." He has been a member of the Garden's Board of Managers since November 1939.

UNTIL about twenty-five years ago very little had been done toward the production of inter-specific hybrids in the genus *Paeonia*. Some few such hybrids had, it is true, been made, but not many.

A cross between one of the Chinese peonies (our ordinary garden peonies) and the little fern-leaved peony, *P tenuifolia*, was made about 1840. The plant was introduced into commerce under the name *P Smouthi*, and it has taken its place in peony culture as a handsome early-blooming variety. The flowers are single, of a bright crimson color, borne on rather tall stems, and they possess a very agreeable fragrance.

In order to make sure that the plant now offered as *Smouthi* was truly a hybrid of the parents named, the present writer some years ago repeated the cross, and obtained a group of plants all very similar in habit to *Smouthi* and bearing crimson flowers having the same fragrance. So there can be no reasonable doubt that our plants of *Smouthi* are truly the hybrid between *P albiflora* (the Chinese peony) and *P. tenuifolia*.

Unfortunately, while the plant has remained the same through the progress of the years it has in the interval got itself re-named, for it is now usually offered as *P anomala* or *P. anomala Smouthi*, though it has no connection whatever with the species *P anomala*. There is some similarity in leaf character between the two, but in many other respects they are quite different. The true *P anomala* is practically not on the market, while *Smouthi* is carried by many of the peony growers; hence anyone who buys plants under the name *P anomala* will be almost certain to receive *Smouthi*. And he will be the gainer thereby, for *Smouthi* is a much finer garden plant than the true *anomala*.

Even earlier than 1840 certain peonies brought into commerce may have been hybrids. I refer to a number of forms which are sold as varieties of either *P. officinalis* or *P paradoxa.* These two European species are closely related to each other and if planted close together they would easily inter-cross and the progeny would show variations from the parent plants. There are about fifty such varieties in commerce offered as forms of one or the other of these two species, and I think it likely that some at least are accidental hybrids between them. Something similar may perhaps be true of the varieties offered under the species *P. decora* and *P. arietina.*

Lemoine introduced in 1905 and the succeeding years a few crosses between the Chinese peonies and the species *P Wittmanniana.* These bear the names ***Le Printemps, Mai Fleuri, Avant Garde, Messagère.*** They are desirable plants for their intrinsic beauty as well as for their very early season.

Lemoine also worked on a much more important cross—that between the then newly-discovered species *P lutea* and the Chinese tree peonies. This was the beginning of an astonishing new race of hybrid shrubby peonies in which yellow is the conspicuous note. The first of them, ***L'Espérance,*** was introduced to commerce in 1909, and from then until now additions have steadily been made to the list; never very many at a time, however, for the cross is not an easy one, and propagation of stock must be by grafting, which is slow.

This account of the older hybrids is not quite complete, for there have been a few others produced, but nothing of major interest up to about 1920. Then a strange thing happened. Unknown to each other, half a dozen peony growers in America began to work on the crossing of the *officinalis* varieties with the Chinese peonies. This cross I am sure had never been made before, and none of those who began to work on it could have imagined what was to come out of their labors. The earliest results began to make their appearance about the years 1928 to 1930, and from then on there has been a bewildering succession of new and startling hybrids brought before the public; and we are still only at the beginning.

Of the many forms of *P officinalis* available, each seems to give a different character to its offspring. The ones most used so far have been ***Rubra Plena, Rosea Plena, Lobata*** (*Sunbeam*), ***Sabini, Otto Froebel,*** and an unnamed single deep crimson. This last gave rise to what is now called the ***Challenger*** strain. These are tall plants with very heavy stems, luxuriant foliage, and enormous cup-shaped single blooms in shades of crimson, many of them very brilliant. Perhaps the most astonishing group however is made up of those which were fathered by the variety ***Lobata,*** which bears flowers of a clear vermilion color. These hybrids range in color from very light salmon pink through shades of salmon, flesh and coral to deep crimson, the flowers being single, semi-double, or

in some fully double. This race in itself is capable of inaugurating a new era in peony growing, for as soon as stocks are available in sufficient quantities many of these enchanting varieties will find their way into gardens everywhere.

Among those who have been particularly active in this field of work I should mention Mr. Lyman D. Glasscock, of Elwood, Ill.; Mr. Edward Auten, Jr., of Princeville, Ill.; Mr. H. S. Bockstoce, of Pittsburgh, Pa.; and Dr. Earle B. White, of Washington, D. C., besides the present writer. Mr. Glasscock has been very successful in producing fine hybrids, many of which have received recognition at the yearly exhibitions of the American Peony Society.

The present writer has gone farther afield than any of the others mentioned and has now in cultivation a large number of strains of hybrids mostly less striking perhaps than those derived from the forms of *officinalis* but still of sufficient merit to warrant their mention here.

An extremely early race came from the crossing of the Chinese peonies with *P. macrophylla,* an early-blooming species from the Caucasus region. Another species of the same geographical origin is the beautiful *P. Mlokosewitschi,* the only truly yellow herbaceous peony. It did not take much imagination to suggest that a race of yellow peonies might be obtained by crossing this species with the Chinese peonies; but for a long time all efforts to effect the cross were failures; only after years of effort and countless vain attempts did Dr. White succeed in producing what appears to be a true hybrid. It has only come to blooming age during the past year or two, but it has, I understand, already produced a few flowers of a true yellow color. Let us hope that this is the forerunner of a race of yellow hybrids which may come out of Dr. White's efforts.

I also worked on this cross for several years with no success, and not having Dr. White's force of character gave it up and turned to make a flank attack on the same problem but using a different procedure, as follows: *P Mlokosewitschi* crosses with *P macrophylla* and gives a race of hybrids which are fertile. (One of the constant difficulties in the peony breeder's path is the sterility of most of his strains of hybrids.) Pollen from these fertile hybrids was used on some of the Chinese peonies. The resulting plants are triple hybrids; that is, they combine the blood of three different species. The most forward plants of this new strain have been coming to the blooming age during the past year or two and some of them bear yellow flowers. Whether they will have garden value it is still too soon to say.

I admit that this was a rather pusillanimous way of bringing about the union of *P. Mlokosewitschi* with the Chinese peonies. My method lacks the valiant quality of Dr. White's determined direct attack. It is much to be hoped that either Dr. White's plants or mine may set some seed

from which second generation plants may be had; and no less to be hoped that such second generation plants may be fertile.

I have said above that many strains of hybrid peonies are sterile. It appears, however, that none of them are completely and permanently sterile. When the plants have grown long enough to make strong clumps there seems always to come the ability to set an occasional seed. Whether these seeds are the result of self-fertilization or whether they are the product of wind-borne pollen it is impossible to say, and would be difficult to determine; but the fact is that fertile seeds are formed and that they

Commander, a peony of the new Challenger strain, characterized by heavy foliage, tall strong stems, and single cup-shaped flowers of glowing crimson.

give second generation plants. What is more than a little interesting is that these second generation plants are in many cases highly fertile.

The hybrids between the Chinese peonies and *P macrophylla* were among the earliest of my crosses. These hybrid plants produced no seed for a year or two after they had begun to bloom; but as the years went on they began to produce occasional seeds, and from these seeds there was obtained a group of second generation plants all or almost all of which have strong pollen and are abundant seed-setters. Since it takes six or seven years to bring a peony from a seed to a plant of blooming age it is evident that one cannot hope to develop many succeeding generations from the original hybrid. I have had a few plants of the third generation that have attained blooming age, but not many as yet, nor do they seem to be markedly different from those of the second generation.

There are many other hybrid strains in being, but to enumerate them all would lead us much too far. Some of them are of interest and some will have value for the garden. A strain obtained by crossing the Chinese peonies with pollen from the southwest European species *P coriacca* bears flowers which are always lavender in color; the best of them are very attractive and the color is new in the peony world; for it is not a dead mauvish pink as in so many of the older peonies, but a good clear lavender.

There is a group of species or so-called species—*anomala, Veitchi, Woodwardi, Beresowskyi*—all rather closely alike and all probably referable to *P anomala*. These give curious results when crossed with the Chinese peonies. In the first generation hybrids the terminal buds often have no stamens and may have from fifty to a hundred abortive carpels; the lateral buds tend to be more normal and occasionally produce seed in spite of this unpromising set-up. These seeds are fertile and have given second generation plants, but none of these have yet come to blooming age.

P. Emodi, the Himalayan peony, which has a good deal the character of *P anomala,* can also be induced to cross with the Chinese peonies; of this strain I have only very few plants, but in one of them which bloomed for the first time in 1939 the many carpels clustered in the center are bright green and the petals white, giving a curious and novel effect.

Some cytological work has been done on the large collection of hybrid plants that now exists in my garden by Dr. G. Ledyard Stebbins, Jr. Anyone especially interested may find papers reporting his work in *Genetics* for January 1938, and in a pamphlet published by the University of California Press under the title "Notes on some Systematic Relationships in the Genus *Paeonia*" (1939).

Much might still be done on the cytology of these plants, and much must be done on their propagation in order that the new types may be made available to the gardening public; for they increase the peony season to about two months instead of one, and they add many beautiful colors hitherto unknown in peonies.

New Methods Of Propagating Hyacinths

By E. E. Naylor

HYACINTHS can be propagated from the green leaves and the flowering stalks as well as from the scales of the old bulb. The latter method, four examples of which are shown in the photograph, has been known to the Dutch bulb growers for centuries, but the use of the foliage leaves and flowering stalks is apparently not generally known.

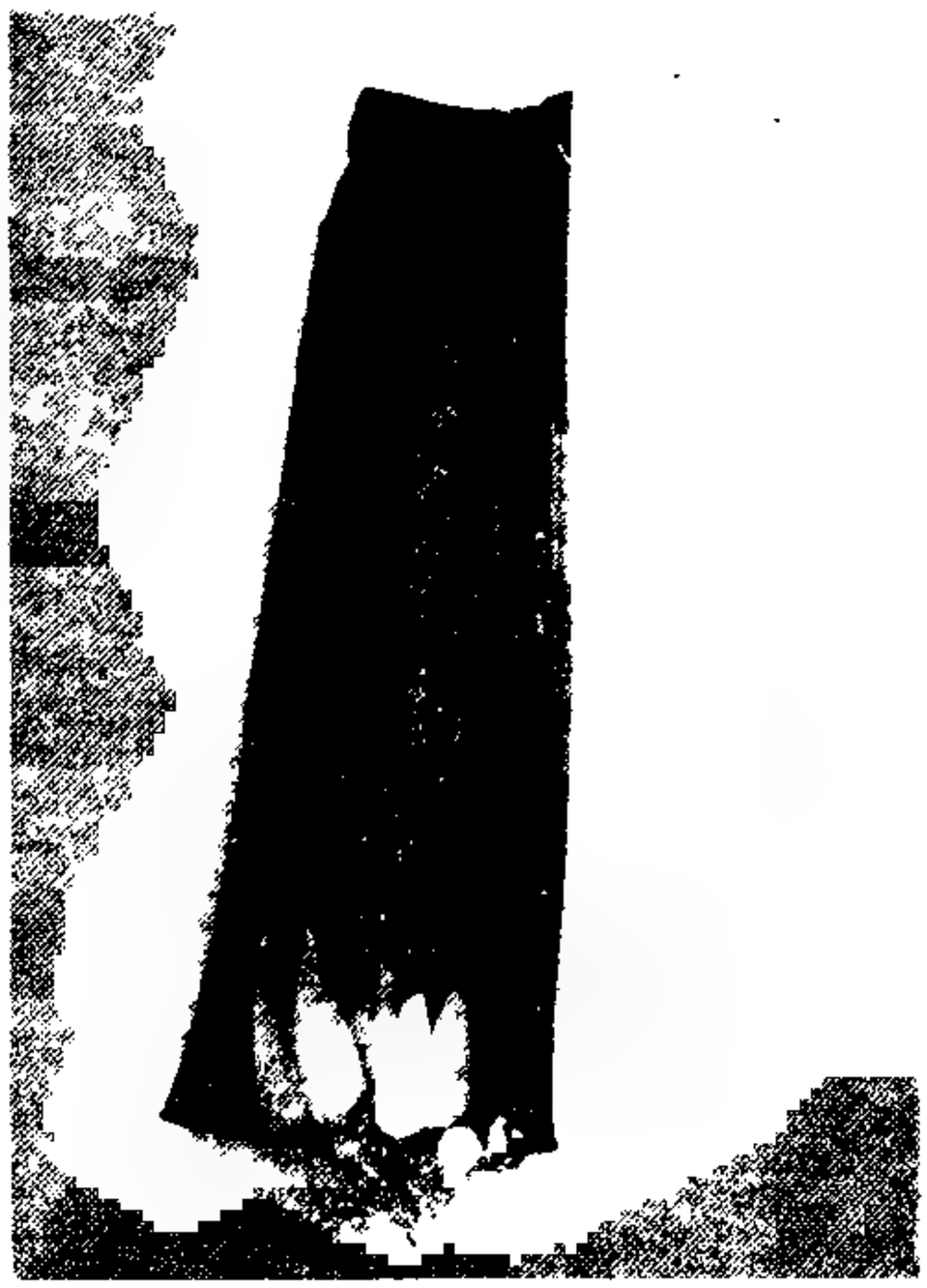
Leaf cuttings may consist of whole leaves removed from near the top of the old bulb, or fractions of one-half or one-third of the leaves. (See photograph p. 87.) Such cuttings may be made as soon as the flowers are fully open, and successful cuttings may be made as long as several weeks after blooming if the leaves have not started to turn yellow. A single plant may furnish as many as a dozen or two dozen cuttings. The leaves toward the outside are more desirable than those near the center because they are usually greener and thicker.

Cuttings should be placed in clean sand in a vertical position with the lower end of the leaf about 3 inches below the surface. They may be allowed to stand very close to each other so that little space is necessary

Hyacinth bulb scales with new bulblets and young roots formed after one month in moist sand.

for a great many cuttings. The sand must be firmly settled around each cutting so that air pockets are not included. Good drainage is necessary and a small amount of bottom heat will hasten bulb formation. The cuttings must not be allowed to wilt after they are placed in the sand. If frequent watering does not keep them turgid it will be necessary to increase the humidity of the air by inverting glass jars over them, or by the use of a small propagating frame that most gardeners have for such purposes.

After two to four weeks many bulblets will be found at the basal end of the leaf, as shown in the photograph. These bulblets are irregularly distributed not only along the basal edge, but also on both sides of the leaf a short distance back from the original cut surface. They are often formed in great profusion and vary in size from almost microscopic points to well rounded structures several millimeters in diameter. These new bulblets grow rapidly and increase in size at the expense of the water and food reserves in the old leaf. Roots do not usually appear until the bulblets have attained some size. Bulblets may then be removed and placed in the nursery in fairly rich soil where they will develop into flowering size in two or three years.



New bulblets formed at the base of a leaf-cutting of hyacinth, after one month in a propagating frame.

The flowering stalks of hyacinths will also give rise to new bulbs if they are separated from the plant before they become too old. They appear to give best results if removed shortly after the flowers are fully opened. Cut off all the flowers and insert the naked stalk 2 to 3 inches deep in moist sand. The writer has obtained new bulbs at the base and along the sides of such cuttings in 26 days under ordinary greenhouse conditions.

These methods of propagation have been found successful in several different hyacinths, including *Hyacinthus orientalis,* var. ***Gertrude***, *H. candicans, H. corymbosus,* and *H. Pouzolsii.* The same methods have proved satisfactory with *Scilla lingulata, Lachenalia luteola,* and *L. tricolor.* Experiments with several varieties of tulips have given negative results.

Botanical Science Helps To Develop A New Relief For Human Suffering

By Claud L. Horn [1]

THE freshly cut leaves of the Barbados aloe, *Aloe vulgaris* Lam.[2], have been known for a long time by the country people of Puerto Rico to be an effective remedy for common burns. Recently the leaves of this plant have assumed importance in the curing of X-ray and radium burns that would not respond to any other treatment. This plant and some related species are also the source of a purgative, Barbados aloe of the pharmacopoeias, which is the dessicated sap from the leaves.

Aloe vulgaris, a member of the Lily family, bears thick, curved leaves, about 14 to 18 inches long and without petioles. These leaves are borne about the base of the flowering stalk that comes from an underground stem. The interior of the leaves, which are extremely fleshy, is so watery and the cell walls are so transparent that one can see directly into a freshly cut leaf to a depth of about 1 inch. When the leaves are crushed or the skin is otherwise broken, they give off a nauseating odor.

This plant is a native of the Mediterranean region and, because of its vitality, has become naturalized in many of the warm parts of the world. It is common along the banks of ravines and fence rows in the southern part of Puerto Rico, where, under the common name of ZÁBILA, it grows in groups such as that shown in the illustration. *Aloe vulgaris* also occurs on other islands of the West Indies, and on the keys of southern Florida, where it is known as "bamboo." Small (11)[3] attributed the name of Bamboo Key, off the coast of Florida, to the fact that *Aloe vulgaris* is so abundant on that key.

As is true with many aloes, the Barbados aloe is quite ornamental, its pretty inflorescence, yellow to burnt orange in color, being borne on a stalk about twice as high as the leaves. In Puerto Rico, it is often grown as a pot plant in dooryards.

Much has been written about the medicinal values of Barbados aloe. Grosourdy, in his lengthy discussion published in Paris in 1864 (8) stated that C. Lemaire found that when the crude, crushed leaves were applied to common burns the severe pain immediately stopped and the usual lesions did not develop.

The earliest mention of its use in medicine that Asenjo (2) found was in the fourth century B.C. Asenjo briefly summarized the value of the

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[1]Mr. Horn is Associate Horticulturist, Puerto Rico Experiment Station, United States Department of Agriculture, Mayaguez, Puerto Rico.

[2] *Aloe vulgaris* Lam. is the correct name for the aloe referred to in the literature, both scientific and popular, as *Aloe vera* L.

[3] Figures in parentheses refer to the bibliography at the end of the article.

Barbados aloe in bloom at the New York Botanical Garden.

plant in the treatment of diseases of the chest, wounds, ringworm, roundworm, and as a purgative, in additon to its use in South America in the treatment of common burns. A search of available literature

Specimen plants of Aloe vulgaris (A. vera) in one of the houses of economic plants at the New York Botanical Garden.

shows this aloe to have been used in the treatment of some 24 ailments. Further information on the use of *Aloe vulgaris* for burns is recorded in a number of publications (1, 3, 4, 5, 7, 9, 10, 12).

In 1937, during the writer's visit to the Missouri Botanical Garden in St. Louis, Ladislaus Cutak, in charge of the succulent plant collection, called attention to the fact that the freshly cut leaves of *Aloe vulgaris* had a short time previously been used in the treatment of severe X-ray burns at a St. Louis infirmary. After standard burn treatments had failed to give relief, the Missouri Botanical Garden was asked if it had any herb that might be tried. In his search of the literature, Cutak found that *Aloe vulgaris* had been recorded as an effective burn remedy. The Missouri Botanical Garden supplied fresh leaves that were applied to the affected parts. Apparent improvement was immediate and healing soon complete. Thereafter, the demand for leaves increased to such an extent that it taxed the supply of the collection at the garden. Cutak later published (6) an account of this new use for this easily grown plant.

More recently, in response to equally urgent requests, the New York Botanical Garden has served the demand for leaves used by hospitals in the metropolitan area until the stock of this species at the Garden became reduced to only a few specimens. Ten plants shown on the greenhouse

bench in the illustration were obtained from Florida. Doctors kept begging for more leaves while the Garden's supply was temporarily depleted. The demand on local commercial greenhouses was also heavy. However, commercial plantings which have been made in southern Florida and plants now occurring naturally in Puerto Rico assure an ample supply of leaves. While the Botanical Gardens have, fortunately, been able to do valuable pioneer work in supplying leaves for use during early studies, the above sources now make it unnecessary to impair valuable specimen plants.

In 1938 the Puerto Rico Experiment Station of the United States Department of Agriculture, located at Mayaguez, began an investigation of *Aloe vulgaris* as a part of a study of new crops for Puerto Rico. Leaves of *Aloe vulgaris* used in clinical tests were transported from Puerto Rico to New Jersey in sound condition. The leaves retained their effectiveness for some time after being severed from the plant; harvested leaves, stored in an open shed in Puerto Rico for one month before shipment to the States were, upon arrival, found still to be effective as a burn remedy. With prompt shipment after cutting, it should be possible to transport leaves of this plant long distances and thus make its curative properties available to sufferers far removed from sources of supply.

A naturalized group of Aloe vulgaris on a bank in southwest Puerto Rico, where it grows in association with other xerophytic plants such as cacti, also Parkinsonia aculeata, Pedilanthus angustifolius, and Plumiera alba.

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Botrytis Core-Rot Of Gladiolus

A Serious Disease of Corms Described

By B. O. Dodge and Thomas Laskaris

THE WRITERS in a brief note[1] recently reported rather extensive losses suffered by some gladiolus growers on Long Island, New York, caused by a typical *Botrytis* core-rot. The sorters call such diseased corms "thumbers," because in sorting out the corms prior to shipment they press the base of each one with the thumb and if it is found to yield to the pressure they reject it as diseased without question.

At the same time, the sorters press the top of the corms as well as the base for softness. In spite of their great care to eliminate all diseased corms, occasionally one will be passed. When such a corm is cut open it shows regions of brown decayed tissue connecting up with the core, which has decayed slightly from above rather than from below or at the base. Diseased tissue becomes deep brown and spongy, sometimes rather soft and wet, no doubt because of secondary invasion by bacteria or other fungi. Mites are often present in the spongy mass. Brown streaks extend from the center through the vascular bundles so that the arms of brown tissue extend to the surface where lesions up to a quarter of an inch in diameter are characteristic symptoms. As the photographs show, these surface lesions may be much elongated, especially in advanced stages of the disease. Old diseased corms frequently become shrunken and mummified. The crust of these mummies consists largely of compact dark-brown to black sclerotial tissue, formed by the *Botrytis*. Occasionally the central core-mass shrinks away or drops out, leaving a clear hole through the center of the corm.

[1] Science **93**: 111. 1941.

Disease of GLADIOLUS

▲ *Surface lesions from which brown arms of diseased tissue extend to the core of the corm.*

Mummified corm, showing a black crust of sclerotial tissue. "Bulbils" of Papulaspora gladioli are often ▼

▲ *Another surface view showing fused lesions.*

A longitudinal section showing an early stage of the rot starting at the basal plate. A healthy cormel lies beside the diseased mature corm. ▼

The core of a gladiolus corm entirely decayed by Botrytis rot and the diseased tissue dried up or dropped out. This corm was a "thumber." ▼

▲ *found on such corms. This fungus has been heretofore mistaken for a Urocystis smut.*

History of the Disease

Moore of England[2] has given us an excellent short discussion of a *Botrytis* disease of gladiolus under the title "Botrytis rot (? *Botrytis gladioli* Kleb.)". He states under (a) where he discusses the disease in the growing plant, that the infection in the healthy plant takes place early in growth but the symptoms are not evident until the flowering period is at hand. The foliage turns yellow and later brown before the plant dies. The *Botrytis* mold then develops on the decaying parts. The decay occasionally begins higher up on the plants.

Moore describes three forms of disease on dry corms: (1), where sunken round lesions develop, straw-colored with a brown margin, with small black sclerotia sometimes present on the surface; (2), where the form of corm rot is more spongy and the infected corms become soft and brown and there is a general decay which spreads from the center of the core into the flesh; in this, *Botrytis* spores develop on the sclerotia and on the infected parts; (3), where real core-rot, a more familiar form of the disease, takes place; here the core is completely rotted and drops out, leaving a hole, or is easily pushed out by the thumb.

Whether, as Moore implies, there may not be two or three different diseases

[2] Diseases of Bulbs. Bull. 117, Min. Agr Fish. 1939.

perhaps caused by as many distinct species of *Botrytis*, is a question which would seem to require further study.

Some of the growers who have furnished specimens of diseased corms for our study are inclined to connect the core-rot condition with field symptoms, since many plants in certain areas of their fields are lost. They realize, however, that they obtain more of the core-rot from lots that were dug when the ground was wet or when the weather was rainy. When the "glads" are grown where there is a good run-off of water so that the ground dries up quickly, there seems to be less loss during the growing season and likewise less core-rot of the corms in storage. This is borne out by a letter which we have recently received from Dr. F. L. Drayton of the Experimental Farms, Ottawa, Canada. He has worked for a number of years on gladiolus diseases. The following excerpts from his letter are interesting and suggestive as to methods of control.

"I have just read with the greatest interest, your article in *Science* for January 31, on the core-rot disease of gladiolus corms. It comes at a time when the seriousness of this disease has just been brought home to me very forcibly. A big gladiolus grower from a town just west of Toronto came to see me two weeks ago and reported a loss of 250,000 corms from a stock of 3 million. . .

"Inoculation of cured corms with this *Botrytis* done several years ago, gave no infection at any temperature, but when I used corms that were just dug they became infected. . . . I concluded that if the curing of newly dug corms was not done efficiently and in the presence of traces of fungus in containers from mild infections of the previous year, some loss may be experienced in storage. In the case of this man with the quarter of a million loss, he dug his corms late last fall during a prolonged period of rain. The turgid and even wet condition of these corms coming to the storage house in huge numbers and with inadequate conditions for quick drying and efficient curing, some of the fungus present on the burlap bottoms of the trays, combined with cool temperatures and the stage was all set for decay and rapid spread of the fungus."

Doctor Drayton also pointed out that there were no signs of the disease in the fields in Canada and in this recent case no gladioli had been grown in that soil previously. Furthermore, the corms were sound when dug and the large corms were affected more than the small ones and the cormels were not at all diseased. All the growers in that vicinity suffered heavy losses, several varieties being susceptible.

Inoculations and Transplants

Drayton's experiments in inoculating cured corms agree with our preliminary experiments where old healthy corms were inoculated with *Botrytis* which we isolated from a number of the diseased corms. Core-rot did not set in. He sometimes found mats of the *Botrytis* mycelium spreading out to healthy corms from diseased ones in storage.

We have made transplants from the diseased tissue, trying to avoid taking old disorganized tissue which is apt to be infested with mites or with the fungi *Penicillium, Trichoderma,* and other soil-borne organisms. Most of the corms showed some growth of a *Penicillium* mold around the base and some showed many whitish or pale yellowish sclerotia of *Penicillium gladioli.* Where large pieces of tissue are transplanted, even though they are surface-disinfected with mercury bichloride, *Penicillium* as well as the *Botrytis* frequently develops. But when small transplants are taken from the region newly invaded, a species of *Botrytis* is very regularly obtained. In cultures the fungus does not develop the conidia very readily; usually sporophores develop on old sclerotia. The sclerotia appear more as crusts of black convoluted tissue made up of large numbers of rather small sclerotia closely joined together. Some transplant cultures in petri dishes show numerous very small sclerotia. The spores of the *Botrytis* isolated range from 12.5 to 21.4μ x 8.3 to 13.2μ, and average 15.8 x 10.5μ. These measurements correspond very closely with those given by Moore[2] for the *Botrytis* associated with the core-rot disease in England.

Quoting from Drayton's letter again:

"One more point of interest. In the summer of 1939 Mr Buddin in England sent me photographs of the perfect stage of a gladiolus *Botrytis* with single ascospore cultures, to see whether it was *S.* (*Sclerotinia*) *convoluta.* I found that this was the same fungus I had always isolated and was definitely not *S. convoluta.* He planned to describe and name it, but no doubt he has had to turn to other work since the war started, and has had to postpone it."

Experiments in Michigan

Nelson[3] of Michigan has studied a core-rot disease of gladiolus in his state. After a rather extensive study he concluded that the disease was due to a species of *Fusarium.* His photographs show corms with the cores entirely rotted so that a hole a half inch in diameter ex-

[3] Mich. Agr. Exp. Sta. Bull. **149**: 43-46. 1937.

Farm Management

AMERICAN HUSBANDRY. Harry J. Carman. 582 pages, indexed. Columbia University Press, New York. 1939. $5.

Most students of agriculture are inclined to believe that farm management is a new science. That such is not the case is revealed by a glance at "American Husbandry."

The author develops his theme remarkably well and in a manner that is readable and interesting. His description of soil types, soil conservation, crop rotations, and crop adaptations are unusually accurate as judged by the twentieth century standard.

"American Husbandry" should be read by everyone interested in the field of agriculture in order to gain a better appreciation of the historical background of modern agricultural practices.

K. H. MUSA,
Long Island Institute of Applied Agriculture.

New Edition of Haupt's Biology

FUNDAMENTALS OF BIOLOGY. Arthur W. Haupt. Third edition. 443 pages, illustrated, indexed. McGraw-Hill, New York, 1940. $3.

The greater part of this work is a competent, nicely illustrated, and entirely conventional description of selected types of plants and animals. The morphologist's point of view is betrayed in the allotment of 9 pages to algae, 5 to bryophytes, and 3 to fungi. There is little discussion of the economic relationships of plants and animals with human life. In the two chapters devoted to "metabolism" vitamins are considered only under "Dietary Requirements" without indication that such substances are among the fundamentals of biology. As in so many similar works vitalism and teleology make their insidious way into the more general discussions. All of which seems scarcely to justify the claim that those aspects of biology are emphasized which are most important in a liberal education. The chapters on heredity and evolution, however, are much more thoughtful and go far to redeem the insufficiency of the first part.

H. W. RICKETT.

Notes, News and Comment

Travelers. B. A. Krukoff left March 14 for a brief trip to the Amazon, where he is devoting the major portion of his time to the investigation of certain products of vegetable origin. He therefore did not contemplate making any extensive botanical collections.

W. H. Camp spent the latter half of March in the southern states working on the identification of blueberries being used in breeding experiments by the United States Department of Agriculture and making collections to further his taxonomic work.

N.A.G. T. H. Everett was chosen to be guest of honor this year at the annual luncheon of the National Association of Gardeners in New York March 18, in recognition of his work in the training of young gardeners, work which has been carried on at the New York Botanical Garden. He has been made a Life Active Member of the N.A.G. Dr. William J. Robbins was also a guest at the luncheon.

Visitors. Dr. A. H. Reginald Buller, Professor Emeritus at the University of Manitoba in Winnipeg, spent several days at the Garden early in March. On March 7 he addressed the staff on "The Mechanics of Fertilization and the Life History of the Systemic Canada Thistle Rust."

Shirley Gale of Radcliffe College, who is working toward a Ph.D. on one section of the genus *Rhynchospora*, did some taxonomic research at the Garden the last of February.

Crowds. A primula show, which contained about 700 plants in several varieties of *Primula obconica, P. sinensis, P. malacoides,* and others including the hybrid *P. kewensis,* combined with azaleas, stocks, and many other flowering plants arranged in garden effect, brought record crowds for the season into the Main Conservatories at the Botanical Garden the middle of March. The Sunday before the opening of the International Flower Show, 1,000 cars carried visitors through the main gate, while the subway and elevated lines swelled the attendance until the aisles were packed with people. The following Sunday, March 23, there were over 2,500

automobiles, and a corresponding increase in the total number of visitors. Between 10:30 and 4:30 scarcely another individual could have been squeezed through the doors. A full quota of 25 persons that morning attended the fourth of the guided tours of the conservatories conducted by Howard Swift. The subject was "Plants in Relation to their Environment."

Conference. Dr. B. O. Dodge spoke on "The Corm Disease of Gladiolus" and Thomas Laskaris on "The Red-blotch Disease of Amaryllis" at the conference of the scientific staff and registered students March 14.

Lectures. Among the staff members who have given lectures, addresses, and informal talks in recent weeks are Dr. William J. Robbins, who addressed colloquium at Columbia University March 11; Dr. H. W. Rickett, Boy Scouts of Elmsford, N. Y., at their annual dinner Feb. 10; Carol H. Woodward, Printing Women Executives' Club March 20; T. H. Everett, Hunter College, March 25, on "Rubbers"; P. J. McKenna, Men's Garden Club of New York, March 6, on "Starting Seeds"; and Dr. H. N. Moldenke, annual banquet of Union County Hiking Club, Feb. 23, on "Our National Parks."

Groups. On the stormiest day of the year, more than 50 students from the School Art League assembled in the lecture hall at the Botanical Garden to hear an address by William L. Ryan, painter. Among other groups which have visited the Garden within the past month are some members of the botany departments of Columbia and Vassar; a group of Girl Scouts, and 15 students from the School of Library Service at Columbia University.

Garden Club Visitors. Under the sponsorship of individual members of the Advisory Council, a number of garden clubs are being brought to the New York Botanical Garden for meetings at which they are being shown the Garden's motion picture, taken on a tour of the conservatories, or shown other special plantings. The first two meetings scheduled were the Garden Club of Rye under Mrs. George McM. Godley April 1 and the Greenwich Garden Club under Mrs. Townsend Scudder April 8.

Army. Among the men who have been called in the selective service draft are Archibald Colquhoun, who left his post at the Garden March 15, and Robert B. Fisher, who left March 28, both of them having worked as student gardeners for nearly two years. Bernard J. Cassidy, a student gardener since October, left March 27. John Bergen, an apprentice since last April, was called at the end of January.

Student Gardener. Lawrence Connolly, a student gardener since September 1938 and the son of Patrick F. Connolly, Foreman at Range 1, left the Garden March 31 to become assistant greenhouse superintendent for the E. W. McClellan Co., Colma, Calif.

Judges. T. H. Everett went to Florida the last of March with Mr. Howard Eric, a member of the Garden, to attend the show of the American Amaryllis Socity at Winter Park, where both men served as judges.

Officer. Dr. W. H. Camp is secretary of the section on systematic botany of the Botanical Society of America for 1941.

Mrs. John K. Small

THE widow of Dr. John K. Small, Elizabeth Wheeler Small, died at her home in the Bronx March 19 after an extended illness.

Mrs. Small, one of whose sisters is Mrs. Percy Wilson and another Miss Margaret Wheeler, who has charge of the mounting of herbarium specimens at the Garden, was closely associated with Dr. Small in his work, especially during his early expeditions into the South. Born in New York, she moved from Greenwich Village to the Bronx after her marriage, and became known as a civic leader there. She was one of the first of active workers in the suffrage movement, in parent-teacher organizations, the League of Women Voters, and the Bronx Women's Club, of which she was a founder. The American Red Cross, Y.W.C.A., W.C.T.U., and other organizations similarly claimed her attention.

Besides the two sisters, she is survived by two sons, John and George; two daughters, Elizabeth Small and Mrs. Kathryn Garber; three brothers, and another sister, Mrs. Gertrude Carroll.

The Herbarium In Scientific Research *

By W. H. Camp

EMERGING from a primitive condition and constantly becoming more aware of his environment, man early acquired the habit of classification—the separation of all objects which entered his consciousness into three main categories: the useful, the harmful, and those which were neither useful nor harmful. As man's consciousness enlarged with the passing of the millennia these rude classifications were broken into more discrete units until, out of this cerebral activity—and prompted both by his curiosity and his needs—there came that body of organized knowledge called Science. Science, therefore, can be no static thing, but must expand in direct proportion as man becomes increasingly aware of his environment through the medium of new instruments and techniques which enlarge the field and scope of his perceptions.

In the beginnings of herbarium practice it was thought that a single specimen was sufficient to represent a species or kind of plant. This, I think, can be linked directly with the Doctrine of Special Creation, a philosophy then current which held that, being specially created, all plants of a given kind must look alike. Therefore, in those early days, it was thought no more necessary to clutter up an herbarium with "duplicate" specimens of a kind of plant than to burden a private library with duplicate copies of the same book. But if man's philosophy, in conjunction with his passion for classification, led him to set up a series of definitions bounding these classificatory units, these kinds or species of plants, it was his insatiable curiosity which drove him to determine the modulus of variation permissible within them. But botanists soon discovered that words were not a completely satisfactory medium for the recording of these variations, that a concrete object was in all ways better, for words, no matter how they are used, are often inadequate to express those differences which human perception indicates are present. And thus began the current herbarium practice of having more than one representative specimen of each kind of plant.

But there soon came a time when this curiosity led the botanist into a series of difficulties, for he began to find his former units of classification unwieldy and was faced with the problem of setting up new units bounded by more finely drawn distinctions. It was then that he fully realized the necessity of having easily available at all times a wide assortment of specimens—records of the plants as they are found in nature—for only thus can he arrive at any reasonable conclusion as to where to draw the lines indicative of the limits of variation between his several entities.

I have spoken of new instruments and techniques which enlarge the field and scope of man's perceptions. Among these we need to mention only one, the microscope. Here is a machine which permits the user to see clearly that which his unaided eye alone could not discern. But the microscope is not solely an instrument of visual perception. It is a tool and, in the hands of the trained worker, ceases merely to be a machine whereby the invisible is made visible but, probing deeply into the recesses of our ignorance, becomes a tester of conclusions derived from the observation of objects in the gross, a dissector of biological hypotheses and thus, out of the fragments of our preconceived notions, an instrument for the building of new and better taxonomic concepts.

In the past the taxonomist, the namer of plants, was not immediately concerned with the mechanics of evolution. Lately he has come to realize that these apparently minor variations with which he has been dealing are of more than casual significance, being the loose ends of threads in the tangled and often knotted skein of evolution, and to understand them is to understand evolution itself. Hence the need of the taxonomist for as many examples of these variations as possible—herbarium specimens representative of the sum total of the differentiations of plants—for only by a study of these can he hope to reach any conclusion as to the directions which evolution has taken within the group under consideration. Know-

* This is one of the addresses given at the Garden Dec. 11, 1940, when the 2,000,000th specimen was incorporated into the herbarium.

ing this, he then can draw the lines between his units of classification—his genera and species—in a reasonably satisfactory manner.

As this is read, there are in this herbarium 1,999,999 specimens of plants. Looked at as they are, each specimen arranged according to its species, each species to its genus, and each genus to its family, this mass of specimens would be only a dry and sterile monument to man's passion for classification were it not put to some use. But it is. Obviously, not each specimen, and every day, but no day passes in the life of any member of this staff without having to make recourse to this repository of botanical variations, this storehouse of information, much of which has not and, by its very nature, cannot be recorded in books.

In this place no outline will be made of the published work by the members of the staff based wholly or in part on specimens in this herbarium, or for that matter, no attempt will be made to list the results of the work done on the more than sixteen thousand specimens on loan last year from this herbarium to workers in other institutions.

Neither can one more than briefly mention a few of the other uses to which the herbarium is put. A physician has a patient allergic to the pollen of a certain plant and inquires: What are its blooming dates so that his patient can arrange his vacation; and where can he go, preferably not too far away, to a place where the air is free of this pollen? A chemist has discovered that the extract of a certain plant—otherwise unknown to him—is a potent insecticide: Where does it grow; and can it be obtained in commercial quantities? A clinician finds that a little-known plant poison is effective in alleviating certain forms of nervous disorders resulting in paralysis: Just what is this plant; and where can it be found? Because of world conditions, a manufacturer of materials based on certain vegetable products suddenly finds himself cut off from his source of supply: Where else in the world does it grow and, if not, is there somewhere a related plant which might be substituted? The horticulturist or agriculturist finding one of his crops seriously threatened by some uncontrollable blight, seeks some immune form with which it may be hybridized and thus partake of its hardiness. Long experience has taught him that nature, with her innumerable variations, has already produced such a form and, being wise, he will consult an herbarium before starting his search, in order to first learn where he is most likely to find such a form, and with a minimum of effort.

To the layman, these queries which come to an herbarium may seem romantic but to the taxonomist they are a daily routine, a part of the job. If he succeeds in answering the question it is because his reply is backed by sufficient information. If he fails, it is because he does not have enough record specimens at his command.

But, as intimated previously, the use of an herbarium is not confined solely to answering these immediately practical and necessary questions. There is back of it a more fundamental thing: the dim but growing realization in the mind of man that, if he is to succeed, if he is to continue his existence, he must first master his environment; but before he can master his environment he must understand it and, his mind being what it is, to understand it, he must classify it.

Now plants are things fundamental to man and he will exist only as he understands them and communicates this knowledge to his fellows. And to communicate this information he must use words and call each plant by name. Therefore, in the final analysis, it is to a place where specimens are kept, aliquot samples of the plants of all the world, to an herbarium, where man must turn. Only here will he find the sometimes divergent viewpoints of the cytologist, the morphologist, the ecologist, and the physiologist brought together, integrated, rationalized and organized around the concept of discrete nomenclatural units—things with names. Thus, having a name for things, through words, man is better able to communicate this information, this knowledge, to others of his kind so that, through the use of medicinal plants the sick may be healed; through agriculture the hungry may be fed and the naked clothed; through forestry, man's lot may be made easier in a multitude of ways; through floriculture, beauty may be brought into his life; and, if for no other reason, that mankind himself—through the knowledge of so important a part of his environment—may continue to exist.

A portion of the Garden's exhibit of Plants of the Bible at the International Flower Show. One of the Biblical "roses," (the oleander) may be seen near the right. Some of the vegetables mentioned in the Scriptures occupied the foreground of the patio.

Gold Medal For Plants Of The Bible

THE Horticultural Society of New York presented a gold medal to the New York Botanical Garden for its educational exhibit of Plants of the Bible at the International Flower Show March 17-22. About 75 different plants were shown, each labeled with its Biblical name, its common name today (if different), and its botanical name. Hand-lettered signs in Old English on a parchment-like paper gave Biblical quotations and explanations of the identity of some of the plants. One large sign made clear the reasons why many plants of the Bible were not correctly identified when the Bible was translated; another told of plants with religious associations which are not actually mentioned in the Bible. A W.P.A. project was responsible for the signs.

The exhibit won the reputation of being the most popular one at the entire Flower Show. About 1,500 copies of the March Journal, containing an article and list dealing with plants of the Bible were sold. The crowds increased throughout the week, until on Saturday night, police protection was necessary to keep the people in line and save the exhibit from being invaded by the crush of onlookers.

Current Literature At a Glance*

Vacations. Nearly 200 national forests where people may spend their vacations are tabulated and described with thumbnail sketches in an illustrated booklet recently issued by the United States Forest Service. These forests are in 37 states, Puerto Rico, and Alaska.

Woodlands. How the woodlot on the farm may be improved to yield a profit and to produce a finer crop of trees is told by Roy M. Carter in Circular 305 of the Extension Service of the College of Agriculture at the University of Wisconsin.

Arizona Cacti. Paintings and photographs in color, photographs in half-tone, distributional maps, and detail drawings of flowers, fruits, and spines are used to illustrate the 134 pages on "The Cacti of Arizona" published last year as Biological Science Bulletin No. 5 by the University of Arizona in Tucson. Seventy-two species in five genera are treated. There is an introductory section on structure and identification and a concluding chapter on culture and care. Lyman Benson prepared the book, in consultation with J. J. Thornber. Maps are by A. A. Nichol and drawings by Lucretia B. Hamilton. It is obtainable for one dollar.

Mosses. The Bryaceae are concluded and the Mniaceae treated by A. LeRoy Andrews in Part 4 of Vol. 2 of A. J. Grout's *Moss Flora of North America*, which was issued in September. The volume is concluded with Part 5, which consists of an appendix, followed by an index to the entire volume. Detail drawings and one photograph illustrate the species.

California. Willis Linn Jepson's *Flora of California* proceeds from the Lennoaceae through the Convolvulaceae in Vol. 3, Part 1. Photographs and original figures illustrate the text, which is published by the Associated Students Store, University of California, at Berkeley.

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* All publications mentioned here and many others may be found in the Library of the Botanical Garden, in the Museum Building.

Brittonia. No. 3, which concludes Vol. 3 of *Brittonia*, contains "The American Species of Hippocrateaceae" by A. C. Smith. The monograph of this family, to which 12 genera in tropical America have been assigned, was completed just before Dr. Smith left New York to join the staff of the Arnold Arboretum. Drawings in the text are by Charles Gilly of the Garden's staff.

Puerto Rico. The Caribbean National Forest in Puerto Rico is the subject of a recently revised booklet issued by the Forest Service of the U. S. Department of Agriculture. The introduction—"Puerto Rico Under Two Flags"—is printed in parallel columns of Spanish and English. Mt. Britton is one of the featured areas. Sections in the booklet are devoted to wildlife protection and to the forest's development under the C.C.C.

Horticulture. Just prior to the annual meeting at Kingston, N. Y., which took place Jan. 29-31, the New York State Horticultural Society issued the Proceedings of the Eighty-fifth Annual Meeting. The paper-covered volume of more than 400 pages is chiefly concerned with the culture of fruits.

Western. "Wild Gardens of Montana and Wyoming" is the title of the picturesque description of the alpine flora of these two states, given by Margaret McKenny in the October (1939) and January (1940) numbers of *Wild Flower*, published by the Wild Flower Preservation Society.

Gardenias. Culture of gardenias in northern greenhouses and southern gardens is outlined in Leaflet 199 of the U. S. Department of Agriculture. A paragraph is also devoted to culture in the home, but it says: "It is an unpromising plant for the home window garden not only because of its need for carefully regulated temperature and humidity but for the additional reason that it is susceptible to several diseases and insect pests which are difficult to control in the home."

Rock Gardening. "Plant Hunting to Rainbow Bridge" by Hugh C. Cutler and "Dwarf Narcissi for the Rock Garden" by David Wilkie are among the worthwhile articles in the 1940 year book of the American Rock Garden Society.

THE NEW YORK BOTANICAL GARDEN

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ARTHUR J. CORBETT .....*Superintendent of Buildings and Grounds*
A. C. PFANDER .....*Assistant Superintendent*

To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by descriptions.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays, programs, lectures, and other events at the Garden.

(5) Credit to the amount of the membership fee paid, toward courses of study offered by the Garden.

(6) The privilege of borrowing lantern slides from the Garden's collection.

(7) Use of the Members' Room in the Museum Building.

A limited number of garden clubs are accepted as Affiliates. The privileges of affiliation are one lecture a year by a member of the staff, a share in the distribution of plants when they are available, a subscription to the Journal and to Addisonia, and announcements of special activities at the Botanical Garden. In addition, any member of an affiliated club may enroll for one subject each year in a study course for one-half the regular fee Beginning January 1, 1942, this regulation will read: "Any member of an affiliated club may receive for the current year of membership a reduction of $5 in the fees paid for instruction. This does not apply to the course for professional gardeners." An Affiliate Garden Club may borrow lantern slides from the Garden's extensive collection, such loan being subject to the regulations for the use of lantern slides by individual members. Likewise, an affiliate club may engage without fee the Members' Room at the Garden for its meetings.

The classes of membership are as follows:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Affiliation	annual fee for club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

Contributions to the Garden may be deducted from taxable incomes The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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IN TWO SECTIONS
SECTION TWO

THE NEW YORK BOTANICAL GARDEN

William J. Robbins, *Director*

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Annual Report of the Director for 1940

William J. Robbins

THE MOST notable event affecting the Garden during the past year was the completion of the boundary fence and the elimination of through traffic, thus giving the Garden for the first time in its history well defined limits and a distinct entity. Although changes will probably be made in the exact location and structure of the chain-link fence on the east side of the Garden when the Bronx River Parkway is extended as planned, it is now possible to look forward to the development of the Garden as a unit. This development will be determined by the topography of the Garden; by the existing buildings and roads; by public attendance; by funds for development; by maintenance costs, and by the objectives for which the Garden was established.

The foregoing conditions seem to dictate the general plan for the future development of the 280 acres now occupied by the Garden. The various essential service functions will be concentrated in an area of 8 or 10 acres located in the southern portion of the region east of the Bronx River. These service functions include the propagating and growing houses; working quarters for the carpenter, plumber, and painters; reserve supply of manure and other materials used in the Garden; experimental gardens for the pathologist and plant breeder; nurseries, root cellar, and so on.

The display plantings of annuals and perennials will be concentrated in the general region occupied by the Conservatory, Museum Building, and Rock Garden. The balance of the Garden will be devoted to attractively arranged woody material, both shrubs and trees.

As will appear later in this report, considerable progress has already been made in the direction of this general plan. Although an enormous amount

still remains to be accomplished, the natural topography of the Garden is such that we can eventually have the finest garden of its kind in existence. From evidence already at hand I know that in working toward this ideal I have the sympathetic assistance of the members of the Board of Managers and City authorities, especially the Department of Parks.

In planning for the development of the grounds and plantings of the Garden others of its activities must not be neglected. Its service functions, including the answering of inquiries about plants and the distribution of information of horticultural and botanical interest, its educational program, and its scientific work, must not be sacrificed in the effort to improve the physical aspects of its grounds.

All of these activities are interdependent. To eliminate or even seriously to curtail any one would handicap all the others. For example, without the scientific staff we could not carry on our educational program and informational service. Without the herbarium and its staff we could not identify and label the plants on our grounds and in our greenhouses. Without our publications we could not inform the scientific or general public of our findings. Without our plantings and collections our scientific staff and educational work would be seriously handicapped. In other words, the Garden is like a highly integrated organism no part of which can be lopped off or starved without injuring the whole. I make these comments to emphasize that one of the most important functions of the Board of Managers, in my opinion, is the maintenance of a proper balance among the legitimate activities of the Garden. The demands of each are such that any one could absorb all of our resources, a situation which would be fatal to the existence of the institution as a Botanical Garden. With these preliminary remarks I shall now review the year's activities.

Buildings and Grounds

Under the supervision of the Superintendent of Buildings and Grounds, Mr. A. J. Corbett, and the Assistant Superintendent of Buildings and Grounds, Mr. A. C. Pfander, notable improvements have been made during the past year. The electric wiring of the basement and of the first and second floors of the Museum Building was completed at a cost of $3,189, and for the first time in our history we have all of the Museum Building illuminated by electricity.

Extensive changes were made in the arrangement of the herbarium. The cryptogamic herbarium, which was located on the second floor, was moved to the third floor, and that portion of the phanerogamic herbarium, located on the third floor, was moved to the second floor. Eleven offices were built on the second and third floors to give accommodations for members of the staff. A room on the third floor was vacated and prepared as a members' room. Dr. Stout's laboratory, which formerly occupied one portion of a library stack room, was moved to an adjacent room which was equipped for his work.

The steam pipe line running along the outside of the Museum Building was renewed; 48 feet of 3½ inch, 3 inch, 2 inch, and 1 inch pipe were used in this replace-

The Museum Building, the interior of which has seen many changes during the year, with the herbarium of flowering plants brought together on the second floor and the cryptogamic herbarium moved upstairs.

ment. Snow guards on the upper dome of the Conservatory Range 1 were installed at a cost of $1,399. The low pressure steam line serving four houses in the Conservatory was renewed. To complete this work 200 feet of 8 inch wrought iron steam pipe were used. The entire water supply system of Conservatory Range 1 was removed and renewed because of the corrosion of old pipes. This required 190 feet of 3 inch galvanized iron pipe, 860 feet of 2 inch, 350 feet of 1½ inch, and 600 feet of 1 inch pipe. A minimum number of miscellaneous repairs were made on Conservatory Range 2, used primarily as a growing and propagating range, and on Propagating Range No. 1 which will be abandoned when the extension of the parkway occupies the land on which it now stands.

Through the assistance of the Work Projects Administration the steam system in Propagating House No. 2 was completely overhauled, and the size of two of the boilers was increased. In addition, two waterlily tanks were built in this range, and the installation of the electric and water systems was completed. It is hoped that we will be able to occupy these propagating houses next year, thus concentrating our work of this character. A concrete root-cellar 30 x 45 x 10 feet was built on the east side of these houses, and eight concrete coldframes 45 feet long, 6 feet 9 inches wide, and 4 feet 6 inches deep, as well as eight wooden frames 45 feet long and 6 feet 6 inches wide and 1 foot 6 inches deep, were built nearby. With the assistance of the Work Projects Administration the electric wiring of the Snuff Mill also was completed. The old Park Department stable, which is planned as a service building for our various mechanics, is now being reconstructed by the Work Projects Administration; its reconstruction is about 80 per cent complete. A manure pit 48 x 80 feet, started last year, in the vicinity of the proposed service building has been completed and is now being used by the Garden.

Paths totaling 3,000 linear feet were built on the east and west sides of the Rubblestone Bridge and in the vicinity of Range 2; these paths are all 10 feet in width. In addition, the Work Projects Administration built a total of 2,500 feet of new roads 16 feet in width. One of these roads furnishes part of the interior driveway of the Garden connecting the Rubblestone Bridge with the main driveway and with the service entrance on Pelham Parkway. The building of this road required the extension of the Rubblestone Bridge for 125 feet. One small arch was erected and a total of 17,500 feet of rubblestone was used to complete this work. Numerous minor improvements were made in the buildings, paths, and roads.

From May to November two police officers in civilian clothes were assigned to the Garden during the afternoon and evening hours. A mounted officer and two patrolmen were assigned to us during the day. In addition, the grounds have been guarded and protected by our own keepers, who were assisted by men from the labor and garden forces. Through the efforts of the police officers assigned to the Garden approximately 100 persons were served with summonses or placed under arrest for violation of park ordinances. The vigilance of these men and of our own guards has kept vandalism and nuisances at a minimum.

Living Plant Collections and Displays

Under the direction of our horticulturist, Mr. T. H. Everett, and with the close co-operation of his assistants, the usual greenhouse and outdoor flower displays and flower show exhibits were maintained at a high standing; in addition, much was accomplished in moving and establishing new plantings of hardy woody material. This work has been undertaken in part because of the changes necessitated by the establishment of the new boundary fence and in part because of the desire to extend the plantings of trees, shrubs, and ground covers to provide a better furnished Garden. It should be emphasized that an enormous amount of labor and material will be needed to complete a program involving the extension of our collections of woody material and unless generous funds are provided for the employment of labor and for the purchase of plants and other supplies, progress must necessarily be slow. During the past year gifts of plant material, the most noteworthy of which are listed below, played an important part.

Gifts and Exchanges

Of the large number of plants received during the year by gift or exchange, the following acquisitions are worthy of special note:

Bagatelle Nursery, Huntington Station, Long Island 7 shrubs.
The Rev. Augustus Batten, Rye, N. Y. — 8 *Aucuba japonica.*
Bobbink & Atkins Nursery, East Rutherford, N. J.—1,062 roses.
Brown Bulb Ranch, Capitola, Calif. –50 tuberous begonias.
Davids & Royston Bulb Co., Los Angeles, Calif. 250 hybrid freesias.
Mr Charles O Dexter, Sandwich, Mass.— 666 rhododendrons and kalmias.
Henry A. Dreer & Co., Riverton, N. J. –50 lachenalias.
Mr. Henry F. du Pont, Winterthur, Del. — 2 large specimens of *Taxus.*
Mrs. William K. du Pont, Wilmington, Del. 5 orchids.

Mr. Howard Eric, Stamford, Conn. 6 orchids, 7 bulbs.
Mr. Samuel Fellner, New York City.—11 succulents.
Mr. Marshall Field, Huntington, Long Island 180 hippeastrums and 95 calanthes.
Florida State Exhibit, World's Fair, Flushing, Long Island—8 trees and shrubs, 13 greenhouse plants.
Mr. Joseph B. Gable, Stewartstown, Penn.—9 rhododendrons.
Mrs. Isaac Gimbel, Portchester, N. Y. collection of 41 cacti
Peter Henderson & Co., New York City — 100 ornithogalums.
Hicks Nursery, Inc., Westbury, Long Island —109 large plants, including 16 yews, 14 star magnolias, 69 azaleas and 10 hollies
P. J. Howard's California Flowerland, Los Angeles, Calif. 300 bulbs.
William M. Hunt & Co., New York City - 183 bulbs.
Roman J. Irwin Co., New York City — 50 fuchsias.
Mr. H. R. Kundhardt, New York City 56 orchids.
Mr. Ernest K. Logee, Danielson, Conn. — 15 pelargoniums and 13 begonias.
Mr. T. MacDougall, New York City. 71 Mexican plants.
McHutchinson & Co., New York City — 50 caladiums.
Col. Robert H. Montgomery, Cos Cob, Conn. —27 palms, 18 evergreens.
Mrs. Ethel Anson S. Peckham, Sterlington, N. Y.—300 irises.
The Rt. Rev. George W. Plummer, New York City—1 Glastonbury thorn.
Mr. Stanley G. Ranger, New York City - 244 orchids, 97 trees and shrubs, 116 succulents, 102 pelargoniums, and 453 other plants.
Mr. J. A. Schuurman, Holland House, New York City—7 succulents.
Mr. Richard Stiles, South Sudbury, Mass. 10 pelargoniums.
Stumpp & Walter Co., New York City — 50 lilies.
Dr. R. C. Van Name, New Haven, Conn. 20 succulent plants.

After listing these gifts I should like to refer to another. This is the gift of $5,000 from Mrs. Elon Huntington Hooker, which is to be used by the Board of Managers at its discretion to initiate the removal of the Rose Garden to a new site, for botanical and horticultural exploration, or for the purchase of suitable cases for the better protection of the herbarium.

Outdoor Gardens

No extensive expansion was made in the outdoor gardens in 1940 but established features were maintained at a high standard of cultivation.

Nearly 1,500 annuals and biennials were raised from seed and used in the Perennial Border of the Advisory Council during the year, and in the fall 4,000 narcissi were planted on the grass bank facing the border.

Tulips provided the main feature of the bedding display, and during May 36,500 bulbs, donated by the Holland Bulb Industry, provided a gorgeous show in the vicinity of the Conservatory. The tulip plantings attracted many visitors and received much newspaper publicity. Ten thousand of the best tulip bulbs from the 1940 display were saved for planting for next spring.

The summer bedding involved the use of more than 30,000 annuals in 186 species and varieties. Of this total more than 20,000 were raised in pots. In addition to the annuals, we used in our summer displays 800 gladioli and 100 tuberoses.

The dahlia display was exceptionally fine; 1,200 plants were exhibited and an additional 300 plants were carried in large pots to effect necessary replacements during the season. Professional dahlia growers contributed 400 of the plants in 150 varieties. The small types, previously shown separately, were moved to the vicinity of the horseshoe containing the larger forms, thus concentrating the dahlias in one area, a general principle we have been following throughout the Garden.

The aster and chrysanthemum borders were as beautiful as they usually are. Of the chrysanthemums, 3,560 plants in 78 varieties were used, and of the asters, 4,080 in 65 varieties. Mr. Henry F. du Pont commented that he had never seen as fine an aster border in this country.

Fifty-one new varieties were added to the plantings of bearded irises, and the areas devoted to Japanese irises were increased by 1,068 square feet, thus providing for larger groups and for the inclusion of 28 new varieties

In accordance with the policy of concentrating the existing cultivated areas, the peonies were moved last year to the vicinity of Range 1. They are making satisfactory growth in their new location.

In the Rose Garden the replacements during the summer totaled 838, a figure which contrasts favorably with the 2,695 plants which were set out in the spring of 1939.

An inventory of the cultivated plants in the Rock Garden, Wild Garden and Meadow Garden, made with the aid of Work Projects Administration workers, shows the total number of species and varieties to be 2,735. Disturbed world conditions have closed many sources of supply for seeds of rock garden plants and it is very important for us to make every effort to maintain our collections by propagation

More than 44,000 tulip bulbs were contributed by the Holland Bulb Industries of Haarlem, Holland, for the New York Botanical's 1940 spring show. While some were made a special feature of the indoor flower displays in March, the majority were used in beds outside the Main Conservatories, where they attracted many thousands of visitors during their season of bloom.

and careful management. Considerable improvements were made during the past year in the Meadow Garden and the Wild Garden. Nearly 2,000 bulbs and plants in 35 species and varieties were planted in the Wild Garden and 400 in the Meadow Garden during the year.

The tropical and hardy waterlilies were maintained outdoors as usual at the Botanical Garden, and in addition, the display of water plants in Gardens on Parade at the World's Fair attracted considerable favorable comment.

As indicated above, much labor was devoted during the past year to the development of the arboretum and as much time and money as could be spared from other activities was concentrated on propagating, growing on and planting out trees, shrubs, and ground covers definitely needed for the embellishment of specific areas. This policy is a continuation of one established earlier. The following comparative figures show its effects: In 1938, 2,598 plants were set out in our permanent collections; in 1939, 3,186, and in 1940, 5,292. During these three years more than 1,000 new species and varieties were added to our permanent collections. In 1938, no ground-cover plants were set out; in 1939, 10,600 were set out, and in 1940, 26,460. Especially noteworthy among the newly acquired woody plants were the additions of rhododendrons. Nearly 350 specimens were added to the fence planting near the main entrance, and 450 to the nursery beds established east of the Museum Building. Most of the latter were species and *R. Fortunei* hybrids contributed by Mr. Charles O. Dexter. These should form the basis for a notable rhododendron display in due time.

Two specimens of *Taxus cuspidata nana* exceeding 14 feet in diameter, the gift of Mr. Henry F. du Pont, were planted on the terrace near the main entrance of Conservatory Range 1.

An unusual ice storm on March 4 damaged more than 700 trees exclusive of native trees in the forested areas, necessitating the complete removal of 25 trees and much pruning. All the trees were heavily burdened with ice. Especially noteworthy was a bald cypress 60 feet high which bent with the weight until it touched the ground but later straightened up without apparent injury.

Indoor Plantings

During 1940 the begonia collection was moved from House 5 to House 14, where informal walls of brick were constructed to contain the soil in the center bed in which 133 plants were set out. Side benches were furnished with potted specimens, and 13 hanging baskets were installed. House No. 5, which formerly accommodated begonias, is now devoted to pelargoniums. The floral displays, both in House No. 4 and in the Tropical Flower Garden, were maintained at a high standard of excellence. Nearly 8,000 plants representing 500 species and varieties were displayed in House 4, and nearly 2,000 in 135 species and varieties exclusive of the plants set out permanently in this house, were used in the Tropical Flower Garden.

The response of the public to these flower displays has been most gratifying. The special Easter display attracted the largest crowd; by actual count more than 9,000 individuals entered through one door of the Conservatory on Easter Sunday. It was estimated that at least 14,000 persons inspected the exhibits on that day, while more than 1,400 automobiles were counted entering the main gate.

Changes in the design of the flower display in House 4 were made for the opening on November 1. Rustic wooden fences were constructed to hide the heating pipes, a pool and fountain were installed, and brick-edged tanbark paths were made between the beds of flowers.

Conservatory Range 2 and the old Propagating House have been operated during 1940 as our main production units. These houses, together with their adjacent frame yards, function as factories, for here the many thousands of plants needed each year for flower beds and borders, the display conservatory, the nurseries, the rock garden, and ground-cover plantings are propagated and grown. It should be emphasized that the figures given from time to time in describing the actual number of plants used in the borders and other displays are as a rule materially less than the actual number grown in the propagating ranges.

Many persons fail to realize the forethought and labor involved in presenting a floral display to the general public. There is likewise little general apprecia-

One of the outstanding gifts of the year was a pair of yews of enormous dimensions, one of which is shown here being set out in the conservatory court.

tion of the large amount of labor involved in making labels, recording accessions, and keeping records of our plantings. For example, during 1940, 2,428 show labels were printed for the outdoor gardens and 1,718 for the Main Conservatories. In addition, 95 large informative labels were prepared for the economic plants. The extent of the problem of labels is indicated by the number of accessioned species and varieties of plants in cultivation at the Garden. During 1940 a complete inventory of all accessioned plants, both in the greenhouses and outdoors, has been made and is to be published. As of November 31 the number of accessioned species and varieties in cultivation at the New York Botanical Garden was 11,934. This figure does not include the collections of decorative material such as roses, dahlias, irises, peonies, asters, chrysanthemums, waterlilies, annuals, or greenhouse plants grown for floral display. The approximate number of these is 2,800, making the total number of species and varieties of plants grown in 1940 at the New York Botanical Garden 14,734. There are very few places in the world where as many kinds of plants can be found together as at the New York Botanical Garden. There is, however, considerable room for improvement. For example, of the nearly 12,000 accessioned species and varieties mentioned above, about 3,100 are hardy trees and shrubs. This is only about one-half of the total number which are hardy or probably hardy here. Yet, since 1919 the number of kinds of hardy woody plants in cultivation at the Garden has nearly doubled, and two thirds of these have been added in the last three years. All permanent plant material set out is recorded on planting plans which are filed for permanent record.

During 1940 the Garden distributed to its members hardy chrysanthemums and specimens of *Achillea tomentosa* var. ***King Edward,*** and *Veronica spicata* var. *rosea.* In this regular distribution nearly 5,000 plants were sent to 307 members. In addition, nearly 10,000 plants were distributed to individuals, to public schools, and other institutions. More than 90 institutions received plant material from the New York Botanical Garden during 1940. Nearly 3,500 packets of seeds in 468 varieties were sent to 237 institutions and to 35 individuals, and we received in exchange 1,450 packets of seed. The 1940–41 seed list includes approximately 460 items.

The exhibit of aquatic plants in Gardens on Parade and the exhibit illustrating the krubi plant (*Amorphophallus titanum*) were maintained at the World's Fair as in 1939.

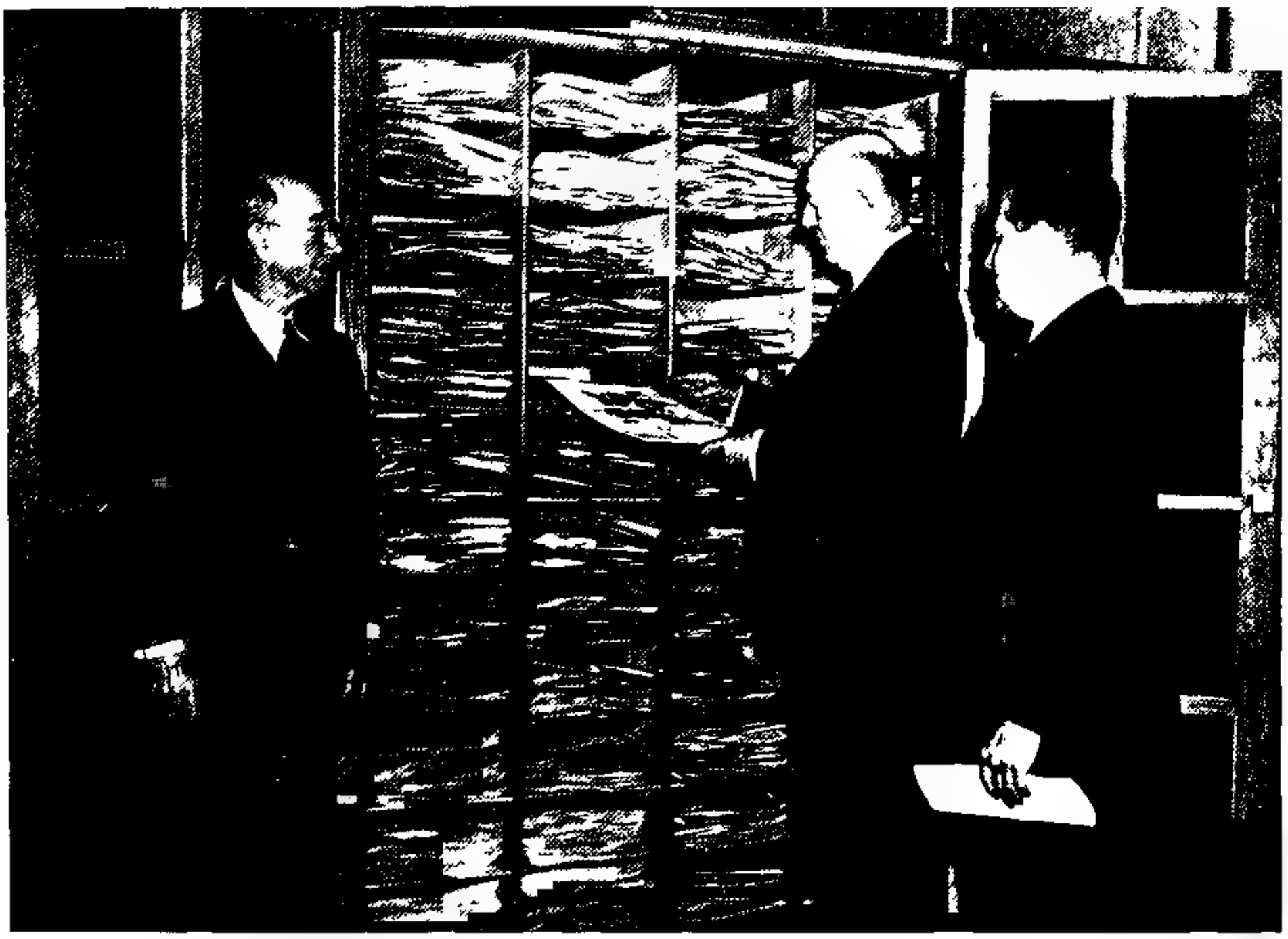
At the International Flower Show held at the Grand Central Palace in March, 142 species and varieties of hardy ferns were displayed. A gold medal and a special prize of $250 were awarded this exhibit. In November, a collection of more than 50 kinds of stone and windowed plants was shown at the Glen Cove, Long Island, Fall Flower Show.

The Herbarium

A drastic revision of the herbarium arrangements was begun in January and has been essentially completed. It involved the removal of all flowerless plants from the second floor to the third, the transfer of the local herbarium from the main floor to the second floor, and the assembling of all flowering plants on the second floor. As a result of this revision the herbarium is more effectively arranged, and the members of the staff are located so they can work more efficiently. During the year 30 half-sized steel herbarium cases were purchased and 3,000 paper boxes. Late in the year the content of the herbarium reached the two-million mark, and the two-millionth specimen was formally inserted by President Swan on December 11 following an appropriate program. During the past year 56,311 specimens were added to the herbarium. The present content of the herbarium is as follows:

General Herbarium	1,059,959	
Oriental Herbarium	241,060	
Local Herbarium	65,238	
Cultivated Herbarium	22,575	
Total Flowering Plants and Ferns		1,388,833
Mosses	173,200	
Hepaticae	61,474	
Algae	87,493	
Lichens	31,348	
Fungi	273,402	
Local Mosses	3,799	
Total Cryptogams		630,716
GRAND TOTAL		2,019,549

The usual loans of herbarium material were continued during 1940. The loans sent out totaled 8,897, and 9,298 sheets



President Swan is placing the 2,000,000th specimen in the herbarium after a program and ceremony which took place Dec. 11. At his left and right are Dr. Gleason and Dr. Robbins.

were borrowed from other institutions for the use of the staff and students.

The importance of the herbarium cannot be over-emphasized. It forms the foundation upon which much of the horticultural and botanical work of the Garden must rest. This is particularly true at the present time when many of the collections in other parts of the world are unavailable and in danger of destruction, and every effort should be made to preserve our own irreplaceable material. I have emphasized the need of replacing the 7,000 paper boxes, in which a large proportion of our herbarium is now located, by permanent steel cases. The herbarium is also distinctly undermanned, and additions to the staff should be made in the near future. Limitation of funds has also made it impossible to add important collections which we should be securing, if the herbarium is to serve its greatest usefulness. A herbarium resembles a library; its growth must not cease lest it become incomplete and out of date. Although we have probably the richest American collection of old specimens from North and South America, we are steadily slipping behind in recently discovered species. This is the result of limited appropriations for the purchase of specimens from regions of particular interest when such are avail able, and the lack of funds for exploration in regions which are poorly known botanically. During the early years of the New York Botanical Garden from 10 to 12 expeditions were conducted annually under the auspices of the institution. During the last ten years such explorations have averaged one per year. Every effort should be made to increase the support for the herbarium.

Photography

During the past year with the assistance of a Work Projects Administration worker, Miss Fleda Griffith made and developed 12,069 negatives; developed 131 films; made 3,922 prints; 141 enlargements; 537 slides and 188 colored slides. In addition, a motion picture in kodachrome was taken in the Garden.

Membership

I am pleased to report that the membership of the Garden increased during the year 1940 by 50 new members.

The increase in the membership of the Garden was the result of the co-operation of the members of the Board of Managers and the Corporation.

The total membership of the Garden is 1,119 classified as follows:

Annual	950
Sustaining	50
Life, Benefactors, Patrons, and so on	104
Garden Affiliates	15

Library

The total number of bound volumes in the library is 48,549. During the past year 19,069 unbound volumes and pamphlets and 840 bound volumes were added. We received 790 periodicals and continuations and added 14,851 catalogued cards. A particularly interesting gift during the past year to the library came from Mrs. Amy Spingarn and consisted of the card file of *Clematis* literature, photographs of *Clematis*, and the horticultural correspondence of the late Col. J. E. Spingarn. An entry certificate of books signed by Dr. David Hosack in 1791 was presented to the library by Mr. Clarence Lewis. Mr. T. MacDougall gave a privately bound volume of miscellaneous Australasian material. A print catalogue in 20 volumes containing 13,349 prints and 15,741 references to our negative and slide collection prepared by the W.P.A. under the supervision of Mr. Wittrock has been filed in the library. During the periods when evening classes have been held in the Museum Building, the library has been opened Monday and Thursday evenings from 6:45 to 10 p.m. Exhibits of books and pamphlets were arranged during the year in connection with the regular Saturday afternoon lectures, and numerous other special exhibits were assembled. Use of the library has increased, and both telephone and letter inquiries have been greater than in previous years. In 1939, 155 written requests for information were answered; in 1940, 266.

Plant Diseases

Dr. Dodge and his assistants have given their usual effective attention to the practical control of plant diseases in the Garden. Several items of special interest in this connection have received attention during the past year and are reported by Dr. Dodge as follows:

European corn-borer. This insect is apparently becoming one of the most troublesome pests of dahlias in the East, if we are to accept reports that come into the office during the growing season. Much damage is reported to be done by the second brood which develops some time in September. Until the last year or two, however, we have not been much disturbed at the Botanical Garden. The insects lay their eggs on the leaves and as the grubs hatch out they first infest the growing ends and young flowers, later boring into the stalks.

We have found that a spray consisting mainly of a four per cent rotenone powder, applied once a week during the summer, is very effective, as we had no trouble whatever this year from these insects. During the early part of the season we alternated with a nicotine sulphate solution to control leafhoppers, aphids and other sucking insects. This, incidentally, contributes largely to the prevention of spread of virus diseases which are carried by the aphids.

Gladiolus thrips. We had an opportunity to try out the tartar emetic — sugar spray against gladiolus thrips during the summer. There can be no question that the complete control of this insect must begin with a treatment of the corms with mercuric bichloride 1:1000 as a dip for 17 hours if the scales are not removed, or two or three hours if scales are removed; the dip to be given just before planting. Then with two or three applications of tartar emetic and sugar during the summer, good control can be obtained. Without the dip and a delay of applying the spray until the flower stalks have started to emerge, we found that even though nine applications were made at intervals of about five days, infested plants can be brought into good flower only with great

difficulty. There will always be some insects hiding under the leaf folds, and once they enter the flower primordia they are beyond control.

Chinch bugs. Chinch bugs have in the past given us some trouble in our lawns, causing brown patches which may be mistaken for the work of Japanese beetles or the fungus *Rhizoctonia.* They gave us no trouble whatever this year. It was not necessary to apply finely ground tobacco dust as occasionally heretofore.

Japanese beetles. There may be some question as to the reason for the scarcity of beetles in our border plantings this year. It may have been due to the weather conditions the preceding year which prevented the eggs from hatching. More likely the reduction occurred because we have now given the arsenate of lead treatment to most of the grass areas in the Garden on this side of the Bronx River. In the Rose Garden, however, we had considerable trouble this year, although the lawns immediately bordering the Rose Garden have been arsenated. The areas outside of the rose plot, especially the area enclosed by the old lilac planting and other grass plots, notably the picnic grounds and vicinity, have not been arsenated. They were sources of the supply of beetles which invaded the Rose Garden; no doubt beetles migrated in from outlying areas also. We have used about two tons of arsenate of lead this year and will need a like amount the coming year to arsenate the rough grass plots in various places. We were unable to complete arsenating the "meadows" south of the Rock Garden.

We have been assured by Dr. Hadley and others that as soon as the method of biologic control by the use of a certain bacterium which causes a wilt disease has been advanced sufficiently to become practical, we will be able to obtain a supply of the organism for colonization. As yet the three or four different types of biologic control that have been worked out are only partially successful and can not be relied upon.

A leafhopper new to the Garden. For a few years past we have noticed a rather serious blotching of the leaves of hazel and apple near the garage. We found that this was caused by a very large and beautiful leafhopper which we were not able to identify. This year we made a still more thorough study as to the distribution of the insect and found that it was appearing on a number of additional hosts, such as mountain-ash, maple, wisteria, etc. As yet it has done very little damage. The symptoms consist of a brown blotching of a portion of a leaf, bordered by a bright yellow margin. Most of the damage appears to be done in early summer. It can be controlled by two or three applications of nicotine sulphate soap preparations. The leafhopper was identified by Dr. E. P. Felt as *Phlepsius ishidae (P. tinctorius).*

Lace-bugs in azalea and rhododendron plantings. The azalea and rhododendron lace-bugs, which can be readily controlled by timely applications of contact insecticides, increase rapidly in these plantings unless the insect is discovered early in its career. The extensive new plantings of rhododendrons demand that this insect be given special attention.

Black-spot and mildew in the Rose Garden. A few varieties, especially those that were planted for the first time in our garden, showed not a little black-spot earlier in the season. As this fungus over-winters on the canes of certain varieties, we must expect some trouble regardless of how carefully the sulphur dusts are applied.

Garden slugs or naked snails. As a rule the large spotted garden slug, *Limax maximus,* has done little damage in our plantings. This year, however, on a number of occasions the snails were found infesting some of our perennials and other low-growing plants in the borders and rock garden. They were also occasionally found later in the season among the dahlias. Some complaints from outside gardens have been passed on to us showing that young dahlia plants made from cuttings may be seriously injured by these animals. We have found that the well known bait of Paris green, applied to lettuce or canteloupe is very effective in the control of these pests. A new commercial product especially designed against slugs and cutworms has also been found to be very effective. It is known as a metaldehyde. We have used this in greenhouses at Range 1, where the climbing cutworm did some damage to amaryllis blooms and to flowers of certain other plants before they were controlled. As the snails hide under old boards and other rubbish, and in pockets of earth beneath the plants, good sanitation demands that all such rubbish be destroyed and the ground about the plants well cultivated. Where this is not done it

SOME PROBLEMS ENCOUNTERED IN PLANT PATHOLOGY WORK IN 1940

(For explanation

IN PLANT PATHOLOGY WORK IN 1940

will be necessary to combat them vigorously with poison baits.

Ring-spot of dahlia. In past years we have had little trouble with the virus disease known as ring spot. For some reason quite a number of our plants were somewhat seriously injured and somewhat stunted in late summer and fall of this year. No doubt many of the roots which were received from outside sources for planting contained the virus. Our gardeners in charge of dahlia growing have fully realized the importance of roguing out dahlias showing mosaic, stunt and ring-spot, but it is not always possible to do this because of the lack of co-operation from outside dahlia growers. Ring-spot has seldom been very serious until this year. We had good control of aphids and fair control of leafhoppers, so that the spread of this virus must have been checked. Where possible roots from diseased plants were not kept for replanting.

Control of greenhouse insects. We are continuing to receive excellent co-operation in this control work. With the purchase of a 50-gallon power sprayer, we are now able to take better care of palms and other high plants in the greenhouses, because with this sprayer, which develops a pressure of from three to four hundred pounds, we are able to reach the tops of plants not possible to spray with the smaller sprayers which have been formerly used in the greenhouses. Because of the objection to the opening of doors in the greenhouses in winter, it has not been possible to do much spraying with the large power sprayer during these months, and it is very difficult, if not impossible, to get the sprayer near the houses without long hoses, a necessity which lowers the pressure. The small sprayer can be used within the houses and so far we have found that exhaust fumes have caused no damage—a point which might be of great interest to other greenhouse operators. Naturally, in tropical houses or rain forest houses, where the temperature and humidity are always high, one must not use nicotine sulphate or oil sprays because under such conditions spray burn follows. We have found that where plants are forced under heat and moisture the leaves become very tender and subject to spray injury, where otherwise they can be sprayed with impunity with nicotine sulphate solutions.

Hot water treatment. Because facilities for giving the hot water treatment to plants and bulbs infested with troublesome insects are inadequate in the greenhouses, we have attempted to supply this deficiency on a number of occasions by doing the work in the laboratory. Certain mites which are difficult to control by sulphurizing or by spraying can be destroyed by this treatment. It might be well to provide the necessary conditions for this work so that it can be done on a larger scale where necessary.

Dogwood bleeding canker. Among the activities connected incidentally with our work at the Garden may be mentioned our study of a bleeding canker of dogwood, a disease which has been noted by others during the past two or three years. It is said to cause the death of many trees of flowering dogwood in the East. The disease has been proved to be caused by the fungus *Phytophthora cactorum*, a fungus which is usually associated with blights or wilts of such plants as the common tulip or snapdragon, foot-rot of lily, and blight of lilacs and rhododendrons. The same organism causes a serious bleeding canker of maples. Many trees in certain localities have been killed. On dogwood the disease appears especially in damp weather and is manifested by a pinkish ooze breaking through the bark of cankered areas, which can be recognized by their shrunken appearance. While yeasts and other fungi, as well as grubs and larvae of insects, have been found in this

SOME PROBLEMS ENCOUNTERED IN PLANT PATHOLOGY WORK IN 1940

TOP: *Gall on rhododendron, caused by a fungus which more frequently attacks only azaleas.* CENTER LEFT: *Injury caused by a nicotine sulphate spray on the leaves of lilies which have been forced in the greenhouse under conditions of high temperature and humidity. The spots resemble Botrytis disease.* CENTER: *Millipedes found in the roots of primulas in the greenhouse.* CENTER RIGHT: *Intumescences, a physiological condition known as oedema, caused by overwatering and lack of ventilation. Epidermal tissue develops galls which break open and turn rusty as though attacked by rust fungi.* BOTTOM: *Surface view of turf that has died because of the feeding done by grubs of the Japanese beetle, shown at the right as they were found just beneath the surface of the soil. When 50 or more grubs are found in a square foot, the turf is usually destroyed.*

slime, there is no question as to the cause of this disease. The parasite apparently may enter the dogwood through wounds which are sometimes made in transplanting the trees or through injury by animals. It does not seem to attack the roots. Another species of *Phytophthora* attacks the roots and crown of maple, causing wilt. This disease of dogwood should be better understood by nurserymen and others interested in ornamental shade trees to the end that badly diseased trees should be destroyed, and wounding while transplanting should be avoided. No doubt the fungus can enter also through succulent side shoots and adventitious buds.

London plane-tree disease. Another shade tree disease we have observed and have been associated with in a minor capacity with Federal workers is that of the London plane. This is a very serious disease in some states, notably Maryland and Pennsylvania. Symptoms of this disease appeared in a number of trees on Staten Island this spring and we were the first to isolate the organism (*Ceratostomella* sp.) and urge the Park Department authorities to get in touch with Dr. Curtis May, who has this disease under investigation. So far as I know, this disease, while reported in Central Park as killing several trees, is not yet present elsewhere in Manhattan or in the Bronx. We suspect that carelessness in allowing dogs to run in the vicinity of young sycamores, such as may be found in large numbers in front of the American Museum of Natural History, results in basal cankers Cankers develop at the base of young trees which cause considerable damage and may be mistaken for the plane-tree disease. Older trees, with thick barks, are apparently not damaged by the dogs.

Core-rot of gladiolus. Recently we have been asked to make a study of a core-rot of gladiolus, a disease which has been known in England for a few years past, but which seems to be rather new in this country. The disease is said to be caused by a species of *Botrytis*. It is of special interest to us because we found in connection with it the so-called smut disease of gladiolus, the cause of which has been referred to a species of smut, *Urocystis gladioli*. We have found what is apparently the same fungus on many diseased gladiolus corms. We believe it appears only in a secondary capacity along with *Penicillium* and other fungi. This fungus, which we believe has passed as a smut, is clearly not a smut but the asexual stage, *Papulaspora,* of some ascomycetous fungus.

Oedema. This physiological disease may appear in greenhouses where the ventilation is poor, thus making the temperature and humidity high. It is often mistaken for a rust disease. It first shows as pimply blisters on the leaves. Later these blisters break and the inner tissues expand and upon exposure to the air oxidize to give the appearance of being rusted. The disease can readily be controlled if one regulates the conditions under which the plants are growing so as to limit the amount of moisture and heat.

Mr. Thomas Laskaris, under the direction of Dr. Dodge, has continued his work on a fellowship granted by the American Delphinium Society. He has studied two important diseases which are relatively little known. One is a *Fusarium* stem-rot and wilt disease, and the second a disease caused by a species of *Pythium*. Mr. Laskaris intends to publish an extended report of his work in the Year Book of the American Delphinium Society.

Education

The educational program of the Garden, conducted under the supervision of Dr. Stout and Mr. Everett with assistance of Miss Woodward and other members of the staff, has developed in a very gratifying fashion. The Two-year Course in Practical Gardening continued to be well attended. During 1940 a total of 239 registrations were received for these classes. In 1939, there were 188 registrations. Mr. P. J. McKenna taught the spring session, the subject being Outdoor Flower Gardening. The subject in Outdoor Gardening Practice was given in three separate classes, the instructors being Mr. Robert Scott, Mr. George H. Gillies, and Mr. John Watts. The 1940 fall session began on September 26, the subject being the Cultivation of Trees and Shrubs taught by Mr. P. J. van Melle. The Two-year Course for Professional Gardeners had an enrollment of 271 as compared to 245 in 1939. A course of 12 afternoon lectures in Garden Appreciation was taught by Dr. Rickett, assisted by Mr. Everett, beginning in April, and Mr. A. C. Pfander

taught a class meeting for 12 successive periods in Rock Garden Construction; 12 students took these courses. A course on Field Botany was taught to 22 students by Dr. Camp in the spring of 1940.

Nineteen students who had completed the Two-year Course in Practical Gardening or the Two-year Science Course for Professional Gardeners received certificates at graduation exercises held at the Museum and Administration Building on June 27; Mr. Max Schling made the principal address of the evening. Representatives of many horticultural groups were present as well as friends of the graduates and employees of the Garden.

The public Saturday afternoon lectures have been well attended, although the attendance at these lectures fluctuates greatly, depending upon weather and subject. Thirty-eight lectures were given to a total of more than 5,500 persons. The speakers included 22 from the staff and 16 from outside. It is felt that the interest displayed by the general public in this series fully justifies its continuance.

Three students completed the requirements for the degree of Doctor of Philosophy at Columbia University, taking their thesis work at the New York Botanical Garden. These were Miss Ellys T. Butler, working under the supervision of Dr. Seaver, Miss Clyde Chandler, working with Dr. Stout, and Mr. Frederick Kavanagh, with Dr. Robbins. William J. Bonisteel of Fordham University also completed the work for his Ph. D. degree at the Garden. In addition, Mr. John D. Dwyer continued graduate work under the supervision of Dr. Gleason and Father Adam of Columbia University began advanced work under Dr. Camp.

Five summer scholarships were awarded in 1940 to: Dr. George J. Goodman of Iowa State College; Arthur Hillegas and Robert E. Lee of Columbia University; James Merry, University of Michigan; and Miss Selma Kojan.

The usual number of independent research investigators and students have spent various periods of time at the Garden. These include Dr. Dorothy Day, Associate Professor of Botany at Smith College, who is spending a year's leave of absence at the New York Botanical Garden; Señor José P. Carabia, who is spending a year in research on the flora of Cuba under a fellowship of the Guggenheim Foundation; Dr. Margaret Fulford of the University of Cincinnati; Dr. A. J. Grout of Newfane, Vermont. Dr. Stanley A. Cain, Professor of Botany at the University of Tennessee, is working at the Garden on a book on ecology under a Guggenheim fellowship.

In discussing the educational activities of the Garden reference should be made to the increasing number of volunteer workers who are given the opportunity for associating themselves with the Garden for practical training. These include high school students, N. Y. A. boys, and a number of individuals interested in gardening.

During the past year 56 groups comprising more than 4,000 individuals visited the Garden under the guidance of members of the staff.

In addition more than 100 lectures and radio addresses were given by members of the staff.

John Watts instructing one of the classes in Outdoor Gardening Practice.

Photograph by William C. Eckenberg, reproduced by courtesy of the New York T

Bibliography

The Bibliographer, Dr. J. H. Barnhart, and the Assistant Bibliographer, Dr. H. W Rickett, have been occupied with editorial work in connection with North American Flora, Mackenzie's North American Cariceae, and similar publications. In addition, they have answered numerous questions dealing with bibliography, biography, and nomenclature as well as other fields related to botany and horticulture.

Finances

Two years ago our budget year was changed from one ending December 31 to one ending June 30. This change was made to agree with the budget period of the City of New York. For this reason the present financial report covers a period of 18 months, beginning January 1, 1939, and ending June 30, 1940. No particular comment need be made on this report except to point out that by strict limitation of our activities the Garden has lived within its budget. The complete financial report is printed on pages 18–25.

Publications

During the past year Mackenzie's monograph on the Cariceae in two volumes was published with more than 500 drawings. This authoritative work will be consulted by anyone interested in this group of plants, and more than 300 sets have been sold in this country. One number of *North American Flora,* part 15 of volume 7, one of *Brittonia,* completing Volume 3, and one of *Addisonia* were published. It is unfortunate that we are unable to publish more numbers of *Addisonia* annually as this represents the only magazine devoted to colored illustrations of horticultural plants in this country. Twelve numbers of the *Journal* and six of *Mycologia* also appeared. It would be extremely desirable from all standpoints to enlarge the Journal of the New York Botanical Garden, and I believe that it might be placed on a self-supporting basis, if the change could be financed for a few years. Three years ago the Journal had almost no subscribers, its distribution being limited almost entirely to the membership of the Garden. A change in editorial policy resulted in an increase of subscriptions to over 500 in 1940. It has a far greater influence than might be believed from its size and limited distribution. For example, in September, 1940, an article by Mr. Alexander on *Tolmica Menziesii,* a plant which propagates by sprouting young plants on the isolated leaves was published in the *Journal.* This article gave rise to a reference to the plant in *House and Garden* in November, 1940, and in *Life;* also to articles in the *New York Times, Herald Tribune,* and several other newspapers, as well as in such horticultural magazines as *Real Gardening* and the *Flower Grower.* In January of this year an enterprising New York florist published an advertisement on the cover of the *Florists' Exchange* to the effect that 20 million people had probably read about "piggy-back plants", then listed the publications in which articles on this plant had appeared. This shows in dramatic fashion the influence which the *Journal* plays.

Two special booklets, one on Begonias and one on Hardy Ferns, were issued during the year and in addition a special eight-page booklet describing the educational program at the Garden and a comprehensive membership booklet were published.

Scientific Work

All members of the scientific staff have been as active in scientific work as their time permitted.

Dr. Dodge in addition to participating as a speaker in various scientific programs and continuing his researches on the fungi, has been engaged in co-operation with Dr. Rickett in the preparation of a comprehensive text on the Diseases of Ornamental Plants.

Dr. Gleason has been occupied with work on the Melastomataceae and on an intensive study of the Flora of the Northeastern United States. In connection with the latter he made a 2 months' collecting trip to the Middle West.

Dr. Camp has continued his studies of the blueberries, which are now a $5,000,000 industry in the United States. Other members of this group, the Ericales, have also engaged his attention, and he has recently initiated a very interesting study of the beeches.

Dr. Moldenke has been occupied in monographing the Verbenaceae and Avicenniaceae and in co-operation with Mr. Krukoff has continued research on the arrow-poison plants of South America.

Mr. Gilly is studying the sedges, and Mr. Krukoff has continued his investigations of various plants important in medicine.

Dr. Seaver has edited *Mycologia*, continued his researches on the cup-fungi, and made a short collecting trip to Bermuda.

Mr. Burke and Mr. Hagelstein have been concerned with two special groups of lower plants, the diatoms and the slime molds.

Dr. Stout, with the assistance of Miss Chandler, has continued research on *Hemerocallis* and has studied particularly interspecific hybrids, flowering behavior, types of growth and of dormancy. Twenty selections of *Hemerocallis* are to be introduced in 1941 as new horticultural clones. In co-operation with the State Experiment Station at Geneva Dr. Stout has continued his work on hardy seedless grapes; 225 have been produced up to date, some of which have distinct commercial possibilities He has also collaborated with the United States Forest Service on hybrid poplars and other tree-breeding work. Other lines of research include studies of sterility and breeding with *Petunia, Lobelia,* and *Lilium.*

Dr. Robbins and his assistants have continued investigations on the relation of vitamins to plant growth.

Dr. Rickett edited and saw through the press Mackenzie's monograph on the Cariceae.

The accomplishment in scientific work is recorded in the appended list of publications.

Space does not permit a detailed presentation of the scientific work of the staff. It probably represents, however, the most enduring and permanent work of the New York Botanical Garden and in the long view it is probably of the greatest value to the general public, though it receives the least popular acclaim and the least momentary attention.

In closing this report I wish to express my appreciation for the assistance received from the Board of Managers and in particular President Joseph R. Swan, who has always been ready to lend his good judgment to any aspect of the Garden's activities; also to the Advisory Council, and to various members of the Department of Parks of the City of New York who have shown their sympathetic interest in the Garden in various ways. I wish also to acknowledge the willing co-operation of the employees of the Garden, without whose intelligent aid little could be accomplished.

For a list of special events at the Garden during 1940, see pages 33 and 34.

REPORT OF THE TREASURER OF THE NEW YORK BOTANICAL GARDEN

ARTHUR M. ANDERSON, Treasurer

EXHIBIT I

BALANCE SHEET

ASSETS

Permanent Fund Assets:			
Investments at cost or appraisal at time of acquisition (Exhibit III)		$2,495,909.74	
Cash awaiting investment		95,983.47	
			$2,591,893.21
Current and Working Assets:			
Cash in banks and on hand:			
For general purposes	$20,526.21		
For special purposes	29,872.89		
		$ 50,399.10	
Accounts receivable:			
City maintenance	$37,303.28		
Employees	27.92		
		37,331.20	
Interest and dividends receivable (Exhibit III)		23,186.96	
Prepaid insurance, premiums, etc.		1,759.99	
			112,677.25
			$2,704,570.46

TO THE BOARD OF MANAGERS OF

THE NEW YORK BOTANICAL GARDEN:

We have made an examination of the balance sheet of The New York Botanical Garden as of June 30, 1940, and of the statements of operations for the six months ending June 30, 1939 and for the fiscal year ending June 30, 1940. In connection therewith, we reviewed the system of internal control and the accounting procedures of the Garden and, without making a detailed audit of the transactions, have examined or

EXHIBIT I
BALANCE SHEET
June 30, 1940

LIABILITIES

Permanent Funds (Exhibit IV):			
Restricted endowments		$ 257,892.30	
Unrestricted endowments, including bequests set aside by the Board of Managers as permanent funds		2,312,842.09	
Special endowment with life interest in respect of income therefrom		21,158.82	
			$2,591,893.21
Current Liabilities and Special Funds:			
Current liabilities:			
Accounts payable		$ 7,265.55	
Special funds (Exhibit V):			
Unexpended income from restricted funds	$ 7,028.41		
Unexpended contributions set aside by the Board of Managers for specific purposes	22,844.48		
		29,872.89	
Deferred income credit:			
Subscriptions paid in advance		104.00	
Working fund:			
Balance at December 31, 1938	$64,997.65		
Add Excess of unrestricted income over expenditures			
Six months ending June 30, 1939 (Exhibit II A)	10,426.95		
Year ending June 30, 1940 (Exhibit II-B)	10.21	75,434.81	
			112,677.25
			$2,704,570.46

tested accounting records of the Garden and other supporting evidence, by methods and to the extent we deemed appropriate.

In our opinion, the accompanying balance sheet (Exhibit I) and related statements (Exhibits II–V, inclusive) present fairly the position of The New York Botanical Garden at June 30, 1940, and the result of its operations for the period of eighteen months ending on that date.

PRICE, WATERHOUSE & CO.

56 Pine Street, New York, August 31, 1940.

THE NEW YORK BOTANICAL GARDEN

EXHIBIT II–A

Statement of Operations for the Period of Six Months Ending June 30, 1939

		Total	Restricted and special funds	Unrestricted
Income:				
Income from investment of permanent funds		$ 52,853.44	$ 4,881.62	$ 47,971.82
Contributions:				
City maintenance		128,114.36		128,114.36
Other		13,000.00	12,400.00	600.00
Membership dues:				
Annual		6,240.00		6,240.00
Sustaining and garden clubs		1,300.00		1,300.00
Sundry sales, fees, etc		1,529.52	110.00	1,419.52
Subscriptions and sales of publications		6,820.57	4,100.36	2,720.21
Total income		$209,857.89	$ 21,491.98	$188,365.91
Expenses:				
Horticulture:				
Salaries	$ 32,971.41			
Plants, seeds, supplies, etc	3,728.95			
		$ 36,700.36	$ 414.29	$ 36,286.07
Science and curating:				
Salaries	$ 23,512.20			
Specimens, supplies, research, etc	3,006.94			
		26,519.14	2,948.22	23,570.92
Library:				
Salaries	$ 4,269.96			
New books, periodicals, etc	1,526.54			
		5,796.50	1,609.61	4,186.89
Education:				
Salaries	$ 2,749.98			
Instructions, lectures, etc	1,232.65			
		3,982.63	2,046.45	1,936.18
Publications		5,548.79	3,177.38	2,371.41
Administration:				
Salaries	$ 12,014.88			
Stationery, telephone, postage, etc	5,953.39			
		17,968.27		17,968.27
Care and up-keep—grounds:				
Salaries	$ 28,898.49			
Wages	12,365.11			
Supplies	2,294.16			
		43,557.76	95.68	43,462.08
Care and up-keep —buildings:				
Salaries	$ 25,669.74			
Fuel, material, supplies, etc	17,589.81			
		43,259.55		43,259.55
Improvement and equipment purchases		1,467.69		1,467.69
Special retirement allowances		3,429.90		3,429.90
Totals:				
Salaries	$133,516.56			
Wages	12,365.11			
Other expenses	42,348.92			
Total expenses		$188,230.59	$ 10,291.63	$177,938.96
Excess of income over expenses for the period of six months ending June 30, 1939		$ 21,627.30		
Restricted—carried to statement of restricted funds (Exhibit V)			$ 11,200.35	
Unrestricted—carried to working fund (Exhibit I)				$ 10,426.95

THE NEW YORK BOTANICAL GARDEN

EXHIBIT II B

Statement of Operations for the Year Ending June 30, 1940

		Total	Restricted and special funds	Unrestricted
Income:				
Income from investment of permanent funds		$103,076.51	$ 9,249.23	$ 93,827.28
Contributions:				
City maintenance		245,001.22		245,001.22
Other		4,829.92	3,735.82	1,094.10
Membership dues:				
Annual		7,685.00		7,685.00
Sustaining and garden clubs		1,475.00		1,475.00
Sundry sales, fees, etc		3,757.21	331.00	3,426.21
Subscriptions and sales of publications		8,787.01	4,785.04	4,001.97
Total income		$374,611.87	$ 18,101.09	$356,510.78
Expenses:				
Horticulture:				
Salaries	$115,056.72			
Wages	24,126.80			
Plants, seeds, supplies, etc	9,294.55			
		$148,478.07	$ 1,748.62	$146,729.45
Botanical science:				
Salaries	$ 32,630.82			
Specimens, supplies, research, publications, etc	12,525.96			
		45,156.78	9,054.32	36,102.46
Public service in education, instruction and information:				
Salaries	$ 34,485.18			
Instructions, lectures, publications, etc	10,345.89			
		44,831.07	1,964.26	42,866.81
Administration:				
Salaries	$ 22,204.86			
Stationery, telephone, postage, etc	7,702.61			
		29,907.47		29,907.47
Repairs and maintenance—buildings:				
Salaries	$ 61,293.24			
Wages	2,806.23			
Fuel, material, supplies, etc	26,672.34			
		90,771.81		90,771.81
Improvements and equipment purchases		3,262.78		3,262.78
Special retirement allowances		6,859.79		6,859.79
Totals:				
Salaries	$272,530.61			
Wages	26,933.03			
Other expenses	69,804.13			
Total expenses		$369,267.77	$ 12,767.20	$356,500.57
Excess of income over expenses for the year ending June 30, 1940		$ 5,344.10		
Restricted—carried to statement of restricted funds (Exhibit V)			$ 5,333.89	
Unrestricted—carried to working fund (Exhibit I)				$ 10.21

THE NEW YORK BOTANICAL GARDEN

EXHIBIT III

Summary of Investments, June 30, 1940

	Par value (no par value stock at book value)	Approximate quoted value	Book value, representing cost or appraisal at date of acquisition	Accrued interest and dividends June 30, 1940	Average yield for year on basis of	
					Quoted value	Book value
					%	%
General funds:						
Bonds	$ 506,500.00	$ 526,390.01	$ 519,728.70	$ 4,267.93	3.74	3.79
Stocks						
Preferred	99,505.00	111,943.75	103,637.50	1,162.50	4.67	5.04
Common	26,103.80	8,594.13	27,573.63	90.00	5.24	1.63
	$ 632,108.80	$ 646,927.89	$ 650,939.83	$ 5,520.43	3.92	3.90
Sage fund:						
Bonds	$ 514,000.00	$ 485,865.63	$ 486,589.69	$ 6,039.26	3.75	3.75
Stocks:						
Preferred	178,730.34	207,190.63	183,587.85	1,106.25	4.60	5.19
Common	75,140.00	146,277.50	107,058.04	1,885.00	5.25	7.17
	$ 767,870.34	$ 839,333.76	$ 777,235.58	$ 9,030.51	4.22	4.56
Special endowment fund:						
Bonds	$ 363,000.00	$ 374,378.77	$ 372,721.33	$ 3,393.31	3.01	3.02
Stocks						
Preferred	126,437.50	173,765.63	147,454.88	1,137.50	4.40	5.19
Common	10,000.00	26,900.00	36,345.16	300.00	4.46	3.31
	$ 499,437.50	$ 575,044.40	$ 556,521.37	$ 4,830.81	3.50	3.61
John D. Rockefeller, Jr., fund:						
Bonds	$ 288,000.00	$ 324,640.63	$ 294,585.25	$ 2,644.80	3.15	3.47
Stocks—preferred	167,068.75	244,806.25	200,256.26	1,160.41	4.45	5.44
	$ 455,068.75	$ 569,446.88	$ 494,841.51	$ 3,805.21	3.71	4.27
Special trust fund:						
Stock—common	$ 16,371.45	$ 2,035.50	$ 16,371.45			
	$2,370,856.84	$2,632,788.43	$2,495,909.74	$23,186.96	3.88	4.09
Recapitulation by types of securities:						
Bonds	$1,671,500.00	$1,711,275.04	$1,673,624.97	$16,345.30	3.47	3.55
Stocks:						
Preferred	571,741.59	737,706.26	634,936.49	4,566.66	4.51	5.24
Common	127,615.25	183,807.13	187,348.28	2,275.00	5.07	4.98
	$2,370,856.84	$2,632,788.43	$2,495,909.74	$23,186.96	3.88	4.09

THE NEW YORK BOTANICAL GARDEN

EXHIBIT IV

Statement of Permanent Funds Showing Changes During the Period of Eighteen Months Ending June 30, 1940

	Balance January 1, 1939	Additions and deductions*	Balance June 30, 1940
Restricted endowments:			
Endowment for science and education	$ 89,115.49	$	$ 89,115.49
Addison Brown Fund	21,149.31		21,149.31
John Innes Kane Fund	35,347.63		35,347.63
Maria De Witt Jesup Fund	25,000.00		25,000.00
Olivia E. and Caroline Phelps Stokes Fund	5,030.63		5,030.63
Charles Budd Robinson Fund	755.04		755.04
The H. H. Memorial Fund	5,000.00		5,000.00
Alexander P. Anderson and Lydia Anderson Research and Fellowship Fund	10,000.00		10,000.00
Students' Research Fund	10,724.50	$ 612.50	11,337.00
Endowment for the publication of "Mycologia"	6,000.00	1,000.00	7,000.00
Nathaniel Lord Britton and Elizabeth Gertrude Britton Fund	46,357.20		46,357.20
Elizabeth Gertrude Britton Fund		1,800.00	1,800.00
	$ 254,479.80	$ 3,412.50	$ 257,892.30
Unrestricted endowments:			
Endowment Fund	$ 251,747.26	$ 1,312.50*	$ 250,434.76
David Lydig Fund	34,337.86		34,337.86
William R. Sands Fund	10,000.00		10,000.00
Darius Ogden Mills Fund	48,099.17		48,099.17
Henry Iden Fund	10,000.00		10,000.00
Fanny Bridgham Fund	30,000.00		30,000.00
Frances Lynde Stetson Fund	25,000.00		25,000.00
Russell Sage and Margaret Olivia Sage Memorial Fund	791,274.89	13,264.89	804,539.78
Frances Griscom Parsons Fund	2,304.67		2,304.67
Special Endowment Fund	552,392.29	9,761.50	562,153.79
The John D. Rockefeller, Jr. Fund	497,228.72	160.00*	497,068.72
The Charles Patrick Daly and Maria Lydig Daly Fund	19,636 34		19,636.34
The James A. Scrymser and Mary C. Scrymser Fund	12,750.00		12,750.00
The George N. Best Fund	3,000.00		3,000.00
The Mary Strong Shattuck Fund	3,517.00		3,517.00
	$2,291,288.20	$ 21,553.89	$2,312,842.09
Special endowment:			
Special Trust Fund	$ 21,158.82		$ 21,158.82
	$2,566,926.82	$ 24,966.39	$2,591,893.21

THE NEW YORK BOTANICAL GARDEN
SPECIAL FUNDS

EXHIBIT V

Statement of Application of Income from Restricted Permanent Funds and Special Funds Designated for Specific Purposes for the Period of Eighteen Months Ending June 30, 1940

	Balance January 1, 1939	Additions	Expenditures and transfers	Balance June 30, 1940
Restricted permanent funds:				
Endowment for science and education:				
Public lectures and instruction, research and sundry publications	$ 3,457.01	$ 4,928.27	$ 5,166.55	$ 3,218.73
Addison Brown Fund:				
Publication of "Addisonia"		1,792.82	1,542.82	250.00
John Innes Kane Fund:				
Purchase of living plants and related expenses	63.32	1,954.46	1,782.55	235.23
Maria De Witt Jesup Fund:				
Botanical collections		1,382.10	1,382.10	
Olivia E. and Caroline Phelps Stokes Fund:				
Investigation and preservation of native plants		277.93	277.93	
Charles Budd Robinson Fund:				
Exploration	28.51	41.46		69.97
The H. H. Memorial Fund:				
Development of model gardens		276.04	276.04	
Alexander P. Anderson and Lydia Anderson Research and Fellowship Fund:				
Research		553.50	553.50	
Students' Research Fund:				
Scholarships and prizes	114.88	606.02	350.00	370.90
Mycologia Fund:				
Publication of "Mycologia"	420.96	8,261.51	5,813.53	1,868.94
Transfer to Mycologia Fund (Exhibit IV)			1,000.00	
Nathaniel Lord Britton and Elizabeth Gertrude Britton Fund:				
Research, exploration, publication, purchase of plants, books, specimens, etc		2,574.64	1,560.00	1,014.64
	$ 4,084.68	$ 22,648.75	$19,705.02	7,028.41

EXHIBIT V—*Concluded*

	Balance January 1, 1939	Additions	Expenditures and transfers	Balance June 30, 1940
Special funds designated for specific purposes:				
School for gardeners	$ 1,574.06	$ 441.00	$ 739.28	$ 1,275.78
Bequest of K. K. Mackenzie:				
Completion and publication of scientific drawings	8,426.95		217.52	8,209.43
Contribution towards fund for specific improvements and developments		12,500.00		12,500.00
Contribution from the American Delphinium Society:				
Investigation of Delphinium root rot disease		1,200.00	1,116.67	83.33
Others	252.96	2,803.32	2,280.34	775.94
	$10,253.97	$16,944.32	$ 4,353.81	$22,844.48
	$14,338.65	$39,593.07	$24,058.83	$29,872.89
Reconciliation with income and expenses during period under review:				
Six months ending June 30, 1939 (Exhibit II–A)		$21,491.98	$10,291.63	
Year ending June 30, 1940 (Exhibit II–B)		18,101.09	12,767.20	
Transfer to principal of Mycologia Fund (Exhibit IV)			1,000.00	
		$39,593.07	$24,058.83	

PUBLICATIONS OF THE STAFF NEW YORK BOTANICAL GARDEN 1940*

Alexander, Edward Johnston
Assistant curator; curator of the local herbarium.
(Editor: Addisonia.)
Aechmea fulgens discolor. Addisonia **21**: 17, 18. *pl. 681.* "6" [26] Au 1940.
Sanchezia parvibracteata. Addisonia **21**: 21, 22. *pl. 683.* "6" [26] Au 1940.
Penstemon dissectus. Addisonia **21**: 23, 24. *pl. 684.* "6" [26] Au 1940.
Solanum sisymbrifolium. Addisonia **21**: 27, 28. *pl. 686.* "6" [26] Au 1940.
Rondeletia leucophylla. Addisonia **21**: 31. *pl. 688.* "6" [26] Au 1940.
A house-plant which propagates itself. Jour. N. Y. Bot. Gard. **41**: 213–216. *illust.* [24] S 1940.
Reprinted: Real Gard. **3**[8]: 63–65. [5] D 1940.
A new species of Graptopetalum. Cactus & Succ. Jour. **12**: 161–163. *illust.* O 1940.
Meiracyllium trinasutum refound. Am. Orchid Soc. Bull. **9**: 144. 1 N 1940.
Southern plant notes. Castanea **5**: 91, 92. N 1940.

Barnhart, John Hendley
Bibliographer.
(Co-editor: North American Flora.)
Bibliography: volume 7. N. Am. Flora **7**: 1047 1108. 14 Je 1940.
Elizabeth Gertrude Knight Britton as a scientist. Jour N. Y. Bot. Gard. **41**: 142, 143. [18] Je 1940.
Collectors of specimens used for illustrations. In. **Mackenzie, Kenneth Kent.** North American Cariceae. 545–547. 3 Jl 1940
Lentibulariaceae [of Panama]. Ann. Missouri Bot. Gard. **27**: 341. 25 S 1940.

Bonisteel, William John
Graduate student (to June); independent investigator (from June).
The sterility of Sparks aconite. Bull. Torrey Club **67**: 93–116. *pl. 9–12. f. 1–5.* 4 F 1940.
Polyploidy in relation to chemical analysis. Jour. Am. Pharm. Assoc. Sci. Ed. **29**: 404–408. S 1940.
The clone in pharmacognosy. Jour. Am. Pharm. Assoc. Sci. Ed. **29**: 453, 454. O 1940.
Revision of the official definitions in the monographs on aconite and other drug plants. Circ. U. S. Pharmacop. Preconf. Bot. **24**: 55, 56. 1940.

Burke, Joseph Francis
Honorary curator of the Diatomaceae (from June).
The diatom collections at the New York Botanical Garden. Jour. N. Y. Bot. Gard. **41**: 278–280. [30] D 1940.
Diatoms and the microscope. Jour. N. Y. Bot. Gard. **41**: 282 284. *illust.* [30] D 1940.

Butler, Ellys Theodora
Graduate student (to June); independent investigator (from June).
Ascus dehiscence in Lecanidion atratum and its significance. Mycologia **31**: 612–623. *f. 1, 2.* 5 O 1939.
Studies in the Patellariaceae. Mycologia **32**: 791 823. *f. 1–10.* 1 D 1940.

Camp, Wendell Holmes
Assistant curator; instructor.
(Editor: Taxonomic Index.)
Vacciniaceae [and Ericaceae of Panama]. Ann. Missouri Bot. Gard. **26**: 297, 298. 30 N 1939.
Necessary changes in the status and nomenclature of certain species of Vaccinium in eastern North America. Am. Midl. Nat. **23**: 177. 6 F 1940.
A new variety of Triphora. Rhodora **42**: 55, 56. 6 F 1940.
Our changing generic concepts. Bull. Torrey Club **67**: 381–389. 4 My 1940.
Aphyllous forms in Pyrola. Bull. Torrey Club **67**: 453–465. *f. 1–4.* 4 Je 1940.
Phyllodoce hybrids. New Flora & Silva **12**: 207–211. *f. 73–75.* Au 1940.
Ericaceae [of Panama]. Ann. Missouri Bot. Gard. **27**: 327–329. 25 S 1940. (With Albert Charles Smith.)
Ericaceae [of extra-tropical South America]. Lilloa **5**: 366. 3 D 1940.
On the recent proposal for a taxonomic journal. Chron. Bot. **6**: 128. 16 D 1940.

Carabia, José Perez
Guggenheim fellow (from August).
Las Bromeliaceas de Cuba. Mem. Soc. Cub. F. Poey **14**: 329–347. 31 D 1940.

*A few publications of 1939, omitted from the list for that year, are here included.

Azaleas and primulas lining a path in the Flower Display House in spring.

Chandler, Florence Clyde
Technical assistant.
Microsporogenesis in triploid and diploid plants of Hemerocallis fulva. Bull. Torrey Club 67 : 649–672. *f. 1–61* [*f. 2–22 = pl. 13, 14*]. 1 N 1940.

Davidson, Harold
Student gardener (March to October).
Why use manures? Gard. Chron. Am. 44 : 46, 64. [1] F 1940.

Degener, Otto
Collaborator in Hawaiian botany.
Flora hawaiiensis. 41 unnumbered pages. *20 unnumbered illust.* 3 Mr–30 Je 1939. (13 pages. *6 illust.* 3 Mr; 4 pages. *2 illust.* 17 Mr; 8 pages. *4 illust.* 14 Ap; 8 pages. *4 illust.* 21 Ap; 8 pages. *4 illust.* 30 Je.)
Flora hawaiiensis. 157 unnumbered pages. *54 unnumbered illust.* 15 Ja–14 Je 1940. (15 pages. *5 illust* 15 Ja; 32 pages. *15 illust.* 10 F; 50 pages. *17 illust.* 15 Mr; 28 pages. *13 illust.* 20 My; 32 pages. *4 illust.* 14 Je.)
Straussia sessilis, a new species from Hawaii. Bull. Torrey Club 67 : 301. 6 Ap 1940. (With Edward Yataro Hosaka.)

Dodds, Donald
Gardener.
Propagating ferns by spores. Gard. Chron. Am. 44 : 144, 163, 164. My 1940.

Dodge, Bernard Ogilvie
Plant pathologist; instructor.
Two serious diseases of shade trees. Jour. N. Y. Bot. Gard. 41 : 93, 94. [16] Ap 1940.
Fern diseases and pests. Jour. N. Y. Bot. Gard. 41 : 116, 117. *illust.* [18] My 1940.
Reprinted in: Woodward, Carol Helen. Hardy ferns and their culture. 37, 48. My 1940.
Second-division segregation and crossing-over in the fungi. Bull. Torrey Club 67 : 467–476. *f. 1, 2.* 4 Je 1940.
Remarks made at the annual meeting of the Torrey Club. Torreya 40 : 88, 89. 5 Je 1940.

Dwyer, John Duncan
Graduate student.
Ochnaceae [from Mount Roraima]. Bull. Torrey Club 67 : 291–293. 6 Ap 1940. (With Albert Charles Smith.)

Everett, Thomas Henry
Horticulturist; instructor.
Plant portraits. Gard. Chron. Am. 44 : 21, *22. illust.* [2] Ja 1940; Gard. Chron. Am. 44 · 360, 361, 364. *illust.* [2] D 1940.
The collection of begonias grown at the New York Botanical Garden. Jour. N. Y. Bot. Gard. 41 : 1–11. *illust.* [25] Ja 1940.
The collection of begonias grown at the New York Botanical Garden. In: Woodward, Carol Helen. Begonias. 1–28. *illust.* F 1940.
[Reprinted from Jour. N. Y. Bot. Gard. 40 : 53–67. Mr 1939; 41 : 1–11. Ja 1940.]
Gardeners are urged to resist the impulse to plant too soon. N. Y. Times 89(29982) : D9. 25 F 1940.
Annuals in their place. N. Y. Times 89(29996)[10] : 8. *illust.* 10 Mr 1940.
Raising ferns from spores. Jour. N. Y. Bot. Gard. 41 : 114, 115. *illust.* [18] My 1940.
Reprinted in: Woodward, Carol Helen. Hardy ferns and their culture. 35, 36. My 1940.
Introduction. In: Peckham, Ethel Anson (Steel). Alphabetical iris check list. [1939]. 1 Jl 1940.
English wallflowers are used for charming bedding effects. N. Y. Times 89 (30143) : D8. 4 Au 1940.
Tradescantia Warszewicziana. Addisonia 21 : 19, 20. *pl. 682.* "6" [26] Au 1940.
Primula obconica. Addisonia 21 : 25, 26. *pl. 685.* "6" [26] Au 1940.
Glycosmis citrifolia. Addisonia 21 : 29, 30. *pl. 687.* "6" [26] Au 1940.
Stone plants and windowed plants. Fall Fl. Show Glen Cove 1940 :89. 2 N 1940.
Gardening indoors: ferns. 1 4. 8 N 1940. (Cooperative extension work in agriculture and home economics, State of New Jersey.) [Radio digest; mimeographed.]
Indoor flower show. N. Y. Sun 108(59) : 25. 9 N 1940. (Anonymous.)
N. Y. Botanical Garden opens indoor display. N. Y. Herald Tribune 100 (34328)[2] : 17. 10 N 1940. (Anonymous.)
Rare plant blooms here. Cuban species at Botanical Garden has thousands of flowers. N. Y. Times 89(30244) : —. 11 N 1940. (Anonymous.)
Botanical Garden shows South African violets. N. Y. Herald-Tribune 100 (34335)[2] · 18. 17 N 1940. (Anonymous.)

A fountain surrounded by glowing chrysanthemums marked the opening of the flower display in the Main Conservatories in November.

Fulling, Edmund Henry
Independent investigator.
(Editor: Botanical Review.)
Syrup and sugar from maples. Jour. N. Y. Bot. Gard. **41**: 232–243. *illust.* [24] O 1940.

Gilly, Charles Louis
Botanical artist.
Cyperaceae [from British Guiana]. Lloydia **2**: 169, 170. "S" [14 O] 1939.
The genus Everardia. Bull. Torrey Club **68**: 20–31. *f. 1–3.* 31 D 1940.

Gleason, Henry Allan
Assistant director; head curator; instructor.
(Co-editor: Phytologia. Co-editor: North American Flora. Associate Editor: Torrey Botanical Club.)
The individualistic concept of the plant association. Am. Midl. Nat. **21**: 92–110. 20 F 1939.
Melastomataceae [from British Guiana]. Bull. Torrey Club **67**: 294. 6 Ap 1940.
The Melastomaceae of the Yucatan peninsula. Carnegie Inst. Wash. Publ. **522**: 323–373. (Botany of the Maya Area: Miscellaneous Papers XX.) 20 Je 1940.
Melastomaceae [of Panama]. Ann. Missouri Bot. Gard. **26**: 295, 296. 30 N 1939.
Melastomaceae [of extra-tropical South America]. Lilloa **5**: 363. 3 D 1940.
Vernonia [of extra-tropical South America]. Lilloa **5**: 439, 440. 3 D 1940.

Griffith, Fleda
Artist and photographer.
Photographing what we see. Jour. Biol. Photogr. Assoc. **9**: 1–4. *f. 1–11.* [22] S 1940.

Hagelstein, Robert
Honorary curator of Myxomycetes.
The Diatomaceae of Porto Rico and the Virgin Islands. Sci. Surv. P. Rico **8**: 313–450. *pl. 3–9.* 19 Ja 1939.
Notes on the Mycetozoa—III. Mycologia **31**: 337–349. 1 Je 1939.
[Field trips of the Torrey Botanical Club.] Trip of September 24 to Mineola, N. Y. Torreya **40**: 25–27. 31 Ja 1940.
Correction [to an article in Mycologia **31**: 728, 729]. Mycologia **32**: 264. 1 Ap 1940.
Notes on the Mycetozoa—IV. Mycologia **32**: 376–387. 1 Je 1940.

Hall, Elizabeth Cornelia

Librarian; instructor.

Fern literature for the student and gardener. Jour. N. Y. Bot. Gard. 41: 73, 74. [9] Mr 1940.
Reprinted in: WOODWARD, CAROL HELEN. Hardy ferns and their culture. 33, 34. My 1940.

Full crop of books. N. Y. Times 89 (29996)[10]: 23. *illust.* 10 Mr 1940.

Garden books of the past twelve months. Libr. Jour. 65: 229–235. *illust.* 15 Mr 1940.

Book Week introduces many new volumes. N. Y. Times 89(30017): D9. 31 Mr 1940.

Gardening books for 1940. Bull. Nat. Counc. State Gard. Clubs 11: 2. [22] O 1940.

Announcement of new garden books. Flower Grower 27: 503, 504. "N" [24 O] 1940. (Anonymous.)

My favorite garden books. Gard. Digest 12[10]: 40–42 [22] N 1940. (A partial reprint, with additions, of: My favorite books for recreational reading. Flower Grower 26: 495. "N" [31 O) 1939.)

Kavanagh, Frederick Walker

Technical assistant.

The response to certain vitamins of fourteen species or strains of the Myriangiales. Phytopathology 30: 10. Ja 1940. (With ARTHUR BURDETTE HILLEGAS and ANNA ELIZA JENKINS) [Abstract.]

Krukoff, Boris Alexander

Independent investigator (to June); honorary curator of economic botany (from June).

Preliminary notes on Asiatic-Polynesian species of Erythrina. Jour. Arnold Arb. 20: 225–233. 28 Ap 1939.

Notes on the botanical components of curare—II. Bull. Torrey Club 66: 305–314. 4 My 1939. (With ALBERT CHARLES SMITH.)

The American species of Erythrina. Brittonia 3: 205–337. 27 O 1939.

A new name for Cocculus toxicoferus Wedd. Brittonia 3: 338. 27 O 1939. (With HAROLD NORMAN MOLDENKE.)

Fabaceae [of Argentina]. Lilloa 5: 362. 3 D 1940.

Laskaris, Thomas

Fellowship student of the American Delphinium Society.

A new Phoma disease of perennial delphinium. Phytopathology 30: 15. Ja 1940. [Abstract.]

Report of the Delphinium crown rot investigation fellowship. Am. Delphinium Soc. Yearb. 1939: 102–108. *illust.* [Ap 1940.]

McKenna, Patrick Joseph

Chief assistant to the horticulturist; instructor.

What factors affect plant hardiness? Gard. Chron. Am. 44: 9, 15. [2] Ja 1940.
Reprinted, slightly condensed: Gard. Digest 12[3]: 14–17. [3] Mr 1940.

Some newer or lesser known annuals. Bull. Gard. Club Am. VII. 7: 107-109. Ja 1940.

Courses for gardeners. Progr. 27th Internat. Fl. Show 144, 145. [11] Mr 1940. [Erroneously credited in the program to: ROBBINS, WILLIAM JACOB.]

The botanical garden: its contribution to culture. La Presse (Montreal). 14 Mr 1940.

Some fundamentals of good rose growing. Real Gard. 3[3]: 16–19. "Je" [26 My] 1940. (Condensed from: Fundamentals of rose-growing. Jour. N. Y. Bot. Gard. 40: 125–129. *illust.* Je 1939.)

Water-lilies, culturally speaking. Gard. Chron. Am. 44: 175, 176. *illust.* [1] Je 1940.

Improving the perennial border. Gard. Chron. Am. 44: 234, 239. [1] Au 1940.

Dependable roses for fall planting. Arts & Decor. (Spur) 52[5]. 14, 44, 45. "S" [Au] 1940.

The perennial border. Gard. Chron. Am. 44: 269, 270. *illust.* [3] S 1940.

Preparation and planting now is a prelude to spring success. N. Y. Times 89 (30178): D12. 8 S 1940.

Mackenzie, Kenneth Kent

Independent investigator (died 22 O 1934)

North American Cariceae 1: i–v, [1–269]. *pl. 1–269.* 2: [270–539], 540–547. *pl. 270–539.* (Illustrated by HARRY CHARLES CREUTZBERG; edited by HAROLD WILLIAM RICKETT.)

Melrose, David Fleming

Student gardener.

Hardy fern exhibit at Flower Show. Forum Annual 1: 3. [13 Ap] 1940.

The New York Botanical Garden offers sanctuary to wild life. Every year ducks come to nest on the grounds and they swim up and down the Bronx River within the park.

Moldenke, Harold Norman

Associate curator; instructor.
(Co editor: Phytologia.)

[Field trips of the Torrey Botanical Club.] Trips of August 26 and 27 to the Watchung Mountains. Torreya 40: 24, 25. 31 Ja 1940.

An additional note on Teesdalia. Castanea 5: 12. 15 F 1940.

An eleventh supplement to edition 3 of H. N. Moldenke's The observed flora of Watchung, N. J., and its immediate vicinity. 1, 2. 17 F 1940. [Mimeographed; 100 copies.]

A supplementary list of common and vernacular names recorded for members of the Verbenaceae and Avicenniaceae. 1–24. 25 F 1940. [Mimeographed; 200 copies.]

Ferns of antiquity. Jour. N. Y. Bot. Gard. 41: 75, 76. [9] Mr 1940.
Reprinted in: Woodward, Carol Helen. Hardy ferns and their culture. 32 My 1940.

A preliminary alphabetic list of invalid and incorrect scientific names proposed in the Verbenaceae and Avicenniaceae; including variations in spelling and accredition. 1–57. 17 Mr 1940. [Mimeographed; 300 copies]

Plants of the Bible. 1–135. 4 Je 1940. [Mimeographed; 400 copies.]

A naturalist in Florida. Torreya 40: 100. 5 Je 1940. [Abstract.]

The Eriocaulaceae, Verbenaceae, and Avicenniaceae of the Yucatan peninsula. Carnegie Inst. Wash. Publ. 522: 137 223. (Botany of the Maya Area: Miscellaneous Papers XVII.) 20 Je 1940.

Verbenaceae. In: Pulle, August Adriaan. Flora of Suriname 4[2]: 257 321. Jl 1940.

Avicenniaceae. In: Pulle, August Adriaan. Flora of Suriname 4[2]: 322 325 Jl 1940.

Marine flowering plants. Torreya 40: 120–124. 31 Jl 1940.

Some new names in the Apocynaceae and Cornaceae and in various American groups. Revista Sudam. Bot. 6: 176–178. Au 1940.

Additional notes on the genus Aegiphila —VI. Phytologia 1: 372–400. 6 S 1940.

Eriocaulaceae [of Panama]. Ann. Missouri Bot. Gard. **27**: 268, 269. 25 S 1940.

Verbenaceae [of Panama]. Ann. Missouri Bot. Gard. **27**: 335, 336. 25 S 1940.

Novelties in the Avicenniaceae and Verbenaceae. Phytologia **1**: 409–432. 2 O 1940.

[Field trips of the Torrey Botanical Club.] Trip of April 21 to the Bartlett Tree Research Laboratories. Torreya **40**: 175. 3 O 1940.

[Field trips of the Torrey Botanical Club.] Trip of May 5 to Plainfield and Watchung, N. J. Torreya **40**: 177. 3 O 1940.

[Field trips of the Torrey Botanical Club.] Trip of June 9 to Dock Watch Hollow and Chimney Rock. Torreya **40**: 179, 180. 3 O 1940.

Additional Verbenaceous novelties. Phytologia **1**: 433–448. 8 O 1940.

Some new species and varieties of Verbenaceae. Caribbean Forester **2**: 13–17. "O" [4 N] 1940.

A list of the observed flora of Watchung, N. J., and its immediate vicinity. 1–44 5 N 1940. [Mimeographed by Union County Park Commission.]

Novelties among the American Verbenaceae. Phytologia **1**: 453–480. 25 N 1940.

New species and varieties of Vitex from South America. Trop. Woods **64**: 29–40. 1 D 1940.

[Field trips of the Torrey Botanical Club.] Trip of October 13 to Branchville, Conn. Torreya **40**. 217, 218. 2 D 1940.

Additional notes on the "Menispermaceae." I. Lilloa **5**: 231-255. 3 D 1940.

Contributions to the flora of extra-tropical South America. I. Lilloa **5**: 353–440. 3 D 1940.

Taxonomy and floristics of the Americas (July to December, 1939). Chron. Bot. **6**: 129–131. 16 D 1940; II. Chron. Bot. 6 154–156. 30 D 1940.

Verbenaceous novelties. Am. Midl. Nat. **24**: 750–754. 30 D 1940.

New or noteworthy South American Eriocaulaceae. Bull. Torrey Club **68**: 67–70. 31 D 1940.

Peckham, Ethel Anson (Steel)

Honorary curator of Iris and Narcissus collections

The new check list. Bull. Am. Iris Soc. **77**: 50. Ap 1940.

A jaunt through New England. Bull. Am. Iris Soc. 78: 41–47. Jl 1940.

Alphabetical iris check list [1939]. 1–582. *illust.* Jl 1940. (American Iris Society.)

Rickett, Harold William

Assistant bibliographer; instructor.

(Editor: Torrey Botanical Club)

Achievements in elementary biology. School and Society **51**: 284–288. 2 Mr 1940.

The life story of a fern. Jour. N. Y. Bot. Gard. **41**: 53–59. *illust.* [9] Mr 1940. Reprinted in: Woodward, Carol Helen. Hardy ferns and their culture. 3–9. *illust.* My 1940.

The devil-flower of the monsoon forest of Malay. Jour. N. Y. Bot. Gard. **41**: 189–192. *illust.* [28] Au 1940.

Robbins, William Jacob

Director; instructor.

(Associate Editor: Bulletin of the Torrey Botanical Club.)

Nutritive factors in plant growth and reproduction. Growth **3**: 317 330. 1939.

Growth substances in agar. Am. Jour. Bot. **26**: 772–778. 4 Ja 1940.

Effect of potato extracts on growth of Phycomyces. Bot. Gaz. **101**: 912–927. *f. 1–3.* 25 Je 1940. (With Karl Clemens Hamner.)

Response of excised tomato roots to β(-4-methylthiazolyl-5)-alanine. Pl. Physiol. **15**: 547–552. *f. 1.* Jl 1940.

Effect of extracts of Phycomyces upon its development. Am. Jour. Bot. **27**: 559–564. *f. 1–6.* 30 Jl 1940.

Sugar—a comment on the sweetest age in history. Jour. N. Y. Bot. Gard. **41**: 177–181. [28] Au 1940.

Growth substances in a hybrid corn and its parents. Bull. Torrey Club **67**: 565–574. *f. 1–4.* 1 O 1940.

Light and the growth of excised roots of Datura. Bull. Torrey Club **67**: 762–764. *f. 1.* 3 D 1940.

Schneider, Hildegard Klara (Kessinger)

Gardener.

Tuberous begonia species native to the Americas. In: Woodward, Carol Helen. Begonias. 40–44. *illust.* F 1940. [Reprinted from Jour. N. Y. Bot. Gard. **40**: 274–278. D 1939.]

Seaver, Fred Jay

Curator; instructor.

(Editor: Mycologia. Co-editor: North American Flora.)

Heterothallism in Ascobolus geophilus. Mycologia **32**: 264. 1 Ap 1940.

Other poisonings with Clitocybe illudens. Mycologia 32 : 267, 268. 1 Ap 1940.

Contributions to the mycoflora of Bermuda—I. Mycologia 32 : 388–407. *f. 1–6.* 1 Je 1940. (With JOHN MACLAREN WATERSTON.)

Photographs and descriptions of cupfungi—XXXV. A new species of Patella. Mycologia 32 : 567–569. *f. 1.* 1 Au 1940.

A new powdery mildew. Mycologia 32 : 649–651. *f. 1.* 1 O 1940.

Smith, Albert Charles

Associate curator (to September); instructor.

A collection of flowering plants from Mount Roraima and adjacent Venezuela, British Guiana, and Brazil. Bull. Torrey Club 67 : 283–299. 6 Ap 1940.

Notes on the genus Amburana Schwacke & Taub. (Torresia Fr. Allem.). Trop. Woods 62 : 28-31. "1 Je" [9 My] 1940.

Araliaceae [of Panama]. Ann. Missouri Bot. Gard. 27 : 324–327. 25 S 1940.

Ericaceae [of Panama]. Ann. Missouri Bot. Gard 27 : 327–329. 25 S 1940. (With WENDELL HOLMES CAMP.)

The American species of Hippocrateaceae. Brittonia 3 : 341–555. *f. 1–12.* 1 N 1940.

Stout, Arlow Burdette

Curator of education and laboratories; instructor.

An autobiography. Herbertia 6 : 30–40. *portr.* Ja 1940.

Distributions of the Mikado daylily. Jour. N. Y. Bot. Gard. 41 . 21. [25] Ja 1940.

Progress in breeding for seedless grapes. Proc. Am. Soc. Hort. Sci. 37 : 627 629. My 1940.

The nomenclature of cultivated plants. Am. Jour. Bot. 27 : 339–347. 12 Je 1940.

Injury to daylilies by thrips. Jour. N. Y. Bot. Gard. 41 : 244, 245. *illust.* [24] O 1940.

Tansey, Joseph William

Foreman gardener; instructor.

Forcing ferns for display. Jour. N. Y. Bot. Gard. 41 : 109, 110, 112, 113. [18] My 1940.

Reprinted in: WOODWARD, CAROL HELEN. Hardy ferns and their culture. 28–31. *illust.* My 1940.

Woodward, Carol Helen

Editorial assistant.

(Editor: Journal of the New York Botanical Garden.)

Frederic S. Lee. Jour. N. Y. Bot. Gard. 41 : 12, 13, 16–18. *portr.* [25] Ja 1940.

Begonias. A series of illustrated articles reprinted from the Journal of the New York Botanical Garden. 1–44. F 1940. (CAROL H. WOODWARD, ed.)

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SPECIAL EVENTS AT THE GARDEN DURING 1940

Mar. 11 16. An exhibit of 142 kinds of hardy ferns at the International Flower Show, for which a gold medal and a special prize were awarded.

Mar. 17. Festival of Spring Flowering Bulbs, celebrating the blooming of more than 8,000 of the 47,000 bulbs which were presented to the Garden by the Holland Bulb Industries of Haarlem, Holland. More than 12,900 persons visited the conservatories on that one day, and more than 700 crowded into the lecture hall to see a motion picture in color, showing a Maryland garden in spring, and to hear addresses by Mr. J. A. Schuur-

The path to the Wild Flower Garden, which on May 9 was the scene of a special ceremony with dedication of a plaque to Elizabeth Gertrude Knight Britton.

man, Consul-General of the Netherlands, and by Mr. George H Gillies on the culture of bulbs.

Mar 16 and Apr. 13. Members of the Torrey Botanical Club visited the various laboratories at the Garden.

Mar. 23. Opening of the Easter Display.

May 9. Wild Flower Program, at which a plaque was unveiled to Elizabeth Gertrude Knight Britton and a fund to be used for wild flower preservation work was presented by the New York Bird and Tree Club. Nine persons spoke on the all-day program, which was attended by about 150 people. Tea was served outdoors by the New York Bird and Tree Club.

May 24. Annual tea of the Advisory Council and the Board of Managers, with 200 members of the Women's National Farm and Garden Association as guests during their annual convention in New York.

May 24–June 1. Rock Garden Week, the first two days being designated as Members' days.

June 27. Graduating exercises in the lecture hall of the Museum Building for 18 members of the Two-year Course in Practical Gardening and one member of the Science Course for Professional Gardeners. Principal address was by Max Schling. Refreshments were served to 200 after the ceremony.

June October. Display of waterlilies and other aquatic plants in "Gardens on Parade" at the World's Fair.

July 19. Men's Garden Club made a special trip to the Garden during their annual convention in New York. About 80 present.

Aug. 22. National Association of Gardeners made a special trip to the Garden during their annual convention. 100 present.

Aug. 22 Children's pageant staged by W.P.A. 300 children present.

Sept. 12 14. Photographs from Garden exhibited at annual convention of Biological Photographic Association in Milwaukee.

Oct. 10. First showing of motion picture of Botanical Garden before the Board of Managers.

Oct. 27. Bronx Committee of Girl Scouts, annual celebration in honor of their founder. 650 present.

Oct. 31. Members' Room opened on third floor of Museum Building at meeting of Advisory Council at which the new motion picture was shown before this group for the first time.

Oct. 30–Nov. 5. 50 kinds of stone plants and windowed plants exhibited at Fall Flower Show at Glen Cove, L. I.

Nov. 1. Opening of Chrysanthemum Display.

Dec. 11. Incorporation of 2,000,000th specimen in the herbarium at program and ceremony, followed by tea in the Members' Room. Addresses by members of the staff; President Swan taking part, and about 100 present.

Dec. 23. Opening of Christmas Display.

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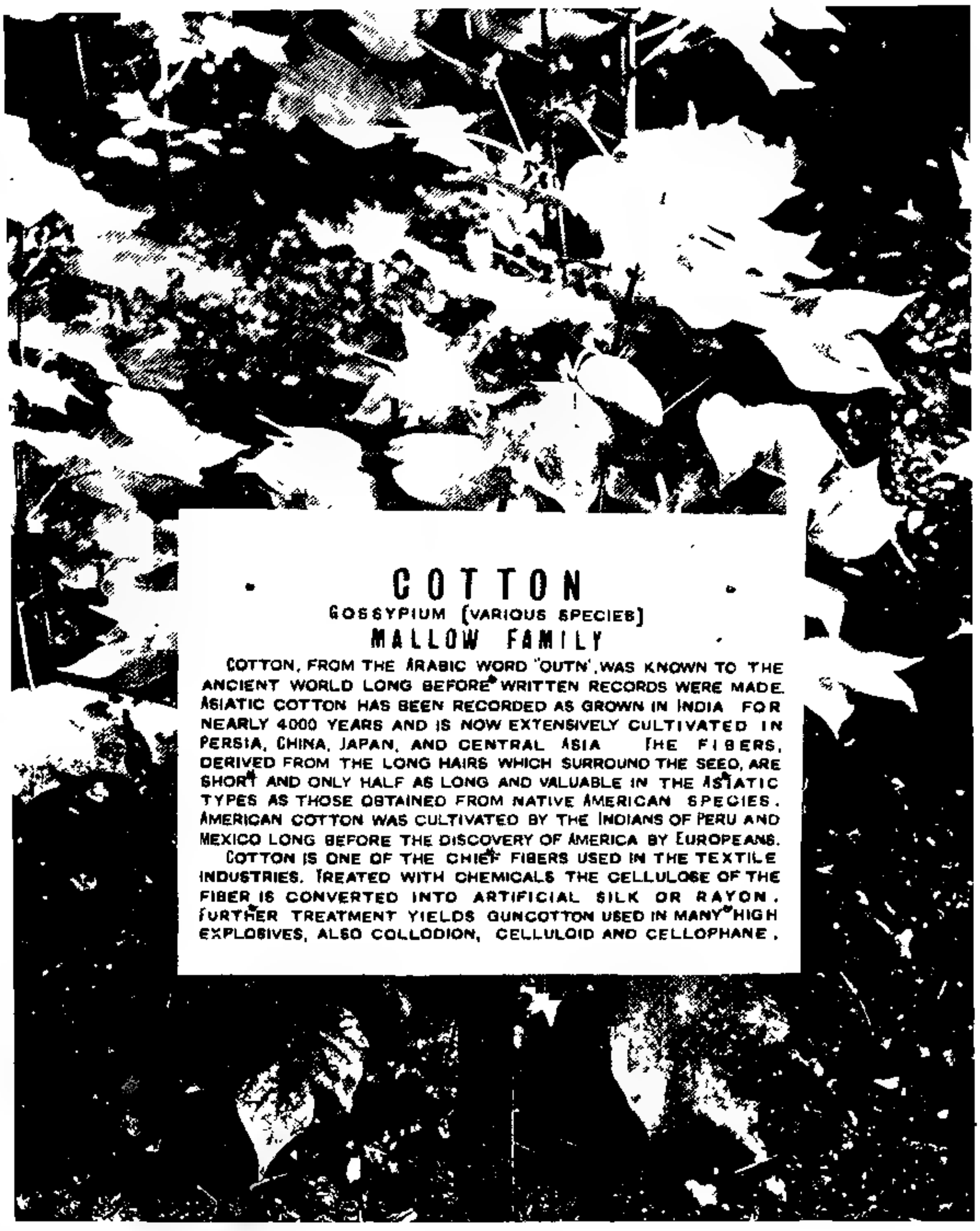
COTTON
GOSSYPIUM (VARIOUS SPECIES)
MALLOW FAMILY
COTTON, FROM THE ARABIC WORD "OUTN", WAS KNOWN TO THE ANCIENT WORLD LONG BEFORE WRITTEN RECORDS WERE MADE. ASIATIC COTTON HAS BEEN RECORDED AS GROWN IN INDIA FOR NEARLY 4000 YEARS AND IS NOW EXTENSIVELY CULTIVATED IN PERSIA, CHINA, JAPAN, AND CENTRAL ASIA. THE FIBERS, DERIVED FROM THE LONG HAIRS WHICH SURROUND THE SEED, ARE SHORT AND ONLY HALF AS LONG AND VALUABLE IN THE ASIATIC TYPES AS THOSE OBTAINED FROM NATIVE AMERICAN SPECIES. AMERICAN COTTON WAS CULTIVATED BY THE INDIANS OF PERU AND MEXICO LONG BEFORE THE DISCOVERY OF AMERICA BY EUROPEANS.
COTTON IS ONE OF THE CHIEF FIBERS USED IN THE TEXTILE INDUSTRIES. TREATED WITH CHEMICALS THE CELLULOSE OF THE FIBER IS CONVERTED INTO ARTIFICIAL SILK OR RAYON. FURTHER TREATMENT YIELDS GUNCOTTON USED IN MANY HIGH EXPLOSIVES, ALSO COLLODION, CELLULOID AND CELLOPHANE.

A typical label provided by the Garden for the plants of economic importance shown in the conservatories.

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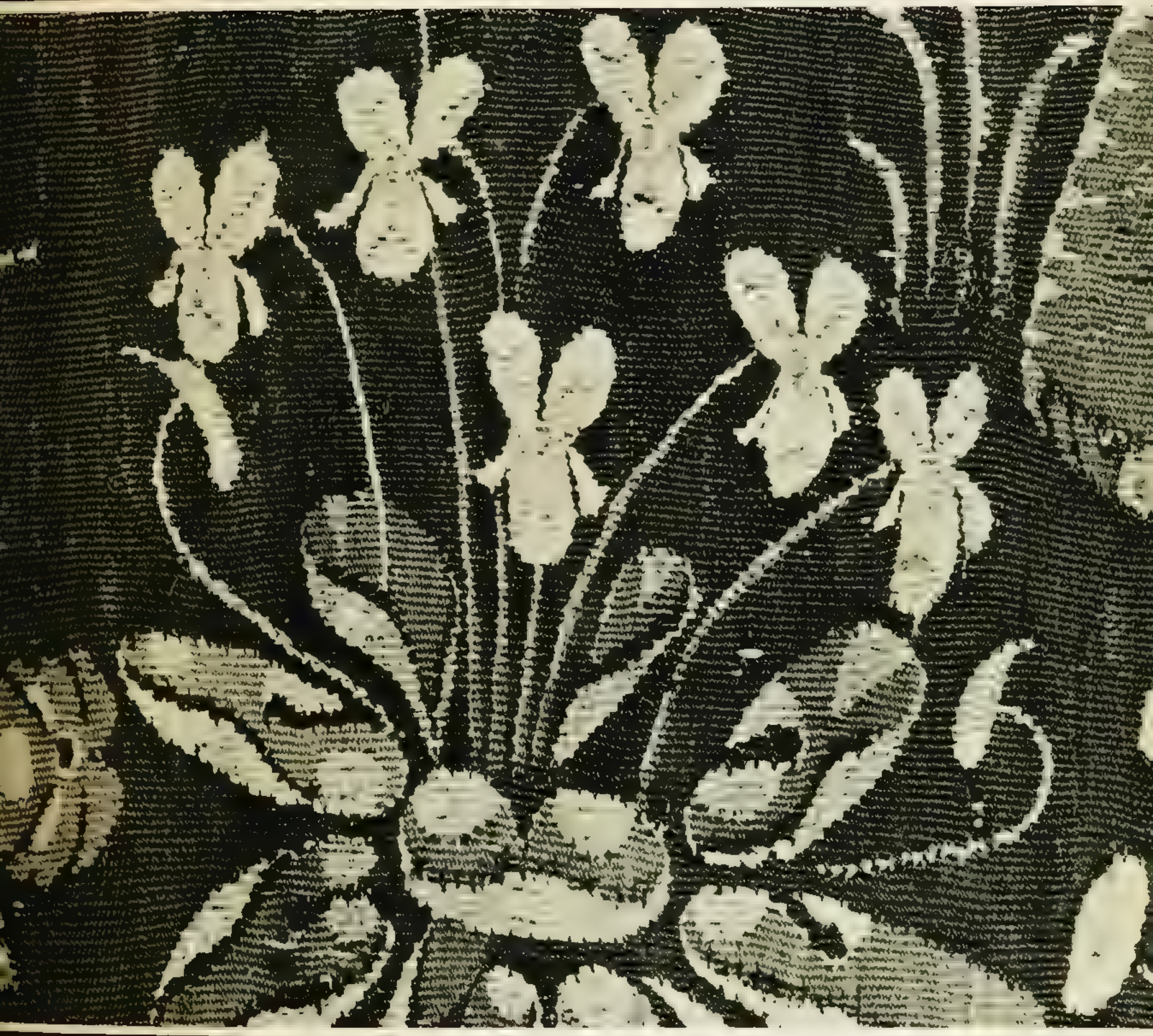

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H WOODWARD, Editor

May, 1941

VIOLA ODORATA A DETAIL FROM ONE OF THE UNICORN TAPESTRIES AT THE CLOISTERS

Cover Photograph by courtesy of the Metropolitan Museum of Art

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A CONTRIBUTION TO ART

Each science and every art is dependent on one or more others for its complete understanding. Botany, for example, frequently turns to geology, and art often calls upon one of the sciences for an interpretation.

This number of the Journal, the first of two to contain special material on the Unicorn Tapestries at The Cloisters, is the result of the New York Botanical Garden's study of the flora of these hangings which are owned by the Metropolitan Museum of Art. Through identification of a large proportion of the plants, new light has been thrown on the tapestries, on the people of the day, and on their knowledge and culture. New questions have arisen as to who these designers and weavers were who had such an intimate acquaintance with plants that they were able to reproduce details of leaf and flower with a perfection unparalleled in any other art form of the period. How many artisans of today could match them in botanical knowledge? They even carefully placed the moisture-loving plants at the water's edge, the correct forest trees together, and the plants of open spaces generally where they belonged in nature. As artisans they were evidently excellent ecologists. A study of botanical illustration of the late 15th and early 16th centuries makes it plain that men who posed as connoisseurs of plants in that day drew but crudely in comparison with those unknown folk who labored on the tapestries.

Acquaintance with the flora in "The Hunt of the Unicorn" increases our admiration for these artisans of long ago and adds to the impressiveness of the tapestries themselves. Science, which is the search for truth, has in this instance contributed toward the appreciation of a masterpiece of art.

SPECIAL UNICORN TAPESTRIES NUMBER

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The Flora Of The Unicorn Tapestries

By E. J. Alexander and Carol H. Woodward

With photographs by courtesy of the Metropolitan Museum of Art

AT THE CLOISTERS in Fort Tryon Park, New York City, hangs one of the most remarkable sets of mediaeval tapestries in existence anywhere in the world today. Although because of their subject the seven hangings have been compared with the famous Unicorn tapestries in the Cluny Museum of Paris, they are unique, distinct in design from their Paris contemporaries, and more realistic in treatment. They are virtually incomparable in their grandeur of design, in the quality of the weaving, the subtlety and variety of their coloring, and the brilliance of their dyes today despite the vicissitudes they have encountered through the centuries. They are noteworthy also for the accuracy of the plants and animals which form a dominant part of the setting of each piece. Except for minor repairs six of the tapestries are intact. Two fragments are all that remain of a seventh tapestry in the series.

On these woven panels, each of which covers approximately 150 square feet, the legendary and symbolic tale of the Hunt of the Unicorn is portrayed.*

Of the actual history of these tapestries, only a few scattered facts are known. Research into their origin has revealed little beyond speculation as to their source, though it is probable that they were woven by French or Flemish artisans toward the end of the fifteenth century and into the sixteenth. Records show that from the eighteenth century on they belonged to the Rochefoucauld family, but they may or may not have been woven for them in the first place. It is believed that they were made to celebrate a wedding and that the now tarnished golden initials A and

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* For a historical description of these tapestries see the handbook of The Cloisters, written by James J. Rorimer, Curator, and available for 50 cents; also the Picture Book of the Unicorn Tapestries, 25 cents, both available at The Cloisters or at the Metropolitan Museum of Art, New York City.

probably E, which appear entwined with a rose-colored cord in each corner and in the center of nearly every one of the tapestries, stand for the names of the bride and groom. But who the couple may have been is as obscure a secret as the name of the designer or of the atelier where the weaving was accomplished. When John D. Rockefeller, Jr.,presented these magnificent textiles to the Metropolitan Museum of Art to be hung at The Cloisters, nothing was known of their history prior to 1728 and researches since then have revealed little or nothing additional of significance.

So far, no historical character has been identified. Even the lord and lady to whom the slain unicorn is presented are personages either imaginary or unknown. The unicorn itself is a legendary animal. Certain phases of the dual symbolism ascribed to the story—that of a wedding and of the Incarnation of Christ—are controvertible, though no one acquainted with the mediaeval mind will deny the presence of the symbolism itself. Amidst all these uncertainties, the animals and the plants depicted stand forth as exquisite realities, most of them recognizable, almost tangible in the life-like manner in which they are portrayed.

There are approximately 115 different kinds of plants represented in the six large tapestries and the fragments. About 85 percent of these are identifiable. The others remain, on the whole, complete mysteries. An attempt is made here to point out some of the conspicuous plants and to discuss some of the controversial ones from the standpoint of their actual resemblance to plants that are known to grow wild in the region from which the tapestries came or to have been cultivated at that early date in western Europe. The botanical outlook will often conflict with the symbolical, which has been so ably set forth by Mrs. Allan Marquand.* But even with a frequently divergent outlook, Mrs. Marquand's success in giving names to 46 of the plants has been an inspiration and often a guide in the present work, although this study has been made entirely independent of hers. While some of her names have provided clues, others have been merely provocative. The religious and secular symbolism with which she deals have been thrust aside here in favor of the botanical point of view. The accuracy of the drawing of the majority of the plants has induced the use of resemblance rather than symbolism as a guide where our ideas have differed from hers.

Even upon casual examination of the tapestries, one is immediately impressed with the striking difference in design and execution of the first and last of the series as contrasted with the others. In these two the plants are scattered over the entire background in a *millefleurs* pattern, while

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* Plant Symbolism in the Unicorn Tapestries by Eleanor C. Marquand. *Parnassus* Magazine, October 1938, Published by the College Art Association, 137 East 57th Street, New York City. (40 cents.)

THE START OF THE HUNT—FIRST OF THE SEVEN UNICORN TAPESTRIES

The background trees of cherry, oak, linden, plum, aspen, and walnut are easily seen. Two or three seedling date palms are conspicuous toward the foreground at the right. Among the 35 or 40 different kinds of plants which appear in the millefleurs background of this hanging, the narcissus, vinca, English daisy, violet, strawberry, and English bluebell (Scilla) stand out prominently.

in the others they appear to grow in naturalistic manner, creating the impression of a scene at the edge of the woods, with forest trees in the rear, flowers of field and open woodland at the front, and small trees and shrubs between. In these the representations are on the whole more accurate and less stylized, though more than 50 of the 60 plants in the first and seventh tapestries are recognizable. However, one is led to the conclusion that the designer of the first and seventh was not always familiar with the plants as they grew, and that he depended on memory or hearsay for their form. Or, he may have been less of a naturalistic artist than a producer of patterns, hence he converted the plants into the style of semi-formal design that was his forte.

In initiating a study of the flora of the tapestries, we had hoped that identification of the plants might furnish a clue as to where the tapestries had been woven. But this idea had to be discarded early, first because the plants depicted are nearly all widespread in western Europe, thus preventing the narrowing down to any one area, and second, because of the realization that the designer may have come from a different country and used the plants which he knew rather than those that were growing in the region of the weavers.

The first and seventh tapestries have by far the greatest number of plants in them, and in view of their similarity of design and floral content they are best discussed before the middle group is considered.

Next to the figures in the first, and the unicorn in the seventh, the outstanding feature in each is the tree which forms the central focus. It is a strange-looking tree which catches the eye in the seventh tapestry, with flat rosettes of pointed leaves at the ends of the branches and a big red-orange fruit set in the center of each. It resembles no tree on earth, but the fruit is a perfect pomegranate, offering an excellent example of how a designer tried to cope with a subject with which he was only half familiar. The pomegranate tree not being hardy in western Europe, he could scarcely have known it unless he had traveled widely, but its fruits he no doubt had frequently seen, for they were brought in by eastern traders from the earliest times.

The central tree in the first tapestry is, in our opinion, the common cherry, *Prunus Avium*. This was considered by Mrs. Marquand as the rowan tree, her conclusion presumably based as much on the symbolism and power attached to this plant as on the small red fruits and the narrow, compound-looking leaves. There have consequently been many discussions about the identity of this tree, as well as another so-called "rowan" to its right, but the rowan, or European mountain-ash, like ours, has terminal clusters containing many berries, whereas the cherry bears its fruits either singly or in small clusters on old wood somewhat back

from the tips of the branches, exactly as they are shown in the tapestry. Because the pomegranate in No. 7 was stylized she has thought that this was too, but the argument does not hold, because the artist had obviously never seen a pomegranate tree, while both cherry and rowan would have been well known to him, and it does not seem, in view of other accuracies, that any designer would have gone so far out of his way as to stylize a familiar tree out of all semblance to its natural habit.

Over at the edge of the forest in No. 1 is the other tree which has been called a rowan. It is similar to the cherry but has larger fruits which appear white but at close range are seen to be pale blue. This we believe to be a plum, which is a tree of the forest's edge, while the cherry is a tree of more open ground, as it is shown here. It is especially notable that the fruits have been made larger than the cherries and are shown without stems, thus still further suggesting blue plums.

Back of the spear-point of the foremost huntsman is a small misty yellowish tree which by most francophiles is thought to be a mimosa (*Acacia*). But it could not be, for the mimosas of France have come from Australia, and Australia was not discovered by Europeans until the 17th century. What is more likely is that this is a distant cluster of elms with reflected sunlight producing the yellowish effect. The remaining forest trees are recognized clearly as oak, linden, aspen, and walnut.

Two unusual looking plants are the palm-like ones in front of the dogs. At first glance, they seem to be ferns, but one soon realizes that there are no ferns of this type in Europe. They are apparently young date palms, small plants raised indoors from the seeds of dates that had been shipped in from the East.

Of the conspicuous flowers which occur only in the first tapestry there are but two. One is the white thistle, the other a hawkweed of undetermined species. In the seventh tapestry, however, there are a number of flowers which appear there alone. Among them are two exquisitely woven carnations (*Dianthus Caryophyllus*), their curling leaves and toothed petals and the long branched style extending out from the center of each flower being as finely done as an etching. In each of the other tapestries (except the fragments) there are other species of *Dianthus,* commonly known as pinks, their broad leaves indicating that they were intended for *Dianthus Seguieri,* as most of the other European pinks (such as *D. plumarius*) have grass-like leaves. Also conspicuous in the seventh is the Madonna lily (*Lilium candidum*) — which is not the same as our Easter lily. Less noticeable but of certain determination once it is found in the bistort (*Polygonum Bistorta*); also the common cuckoo-pint (*Arum maculatum*), a plant which takes the place of our jack-in-the-pulpit in woodlands of England and the continent. The spurred blue

flowers of columbine (*Aquilegia vulgaris*) are at the bottom near the center and at the left near the top. A wild orchid, possibly *Orchis mascula,* appears immediately in front of the unicorn, its stalk of flowers barely visible against his white body.

A unique flower (or fruit) in the seventh tapestry has proved annoyingly intriguing. It is a plant of rosette growth with stalks bearing peculiarly drooping structures, each like a saucer held on edge with battlemented borders, the "saucer" attached in one case near the center, in another near the top. This same thing appears in fragmentary form but a different color in the first, but both are completely unidentifiable. It is one of several small plants to which no clue can be found.

Two especially prominent flowers appear in the first and seventh tapestries without being shown in any of the others. A yellow daisy-like flower with smaller heads and more numerous rays than the other daisies is evidently *Inula salicifolia,* a relative of the elecampane of gardens. Appearing as an original in the seventh and on the restoration in the first is the milk or holy thistle, *Silybum Marianum,* clearly recognized by the light veining on its leaves and the leafy bracts at the base of the flowerhead. Although native of the Mediterranean region, it has long been spread over Europe as a weed.

At the lower right edge of Tapestry No. 7 is one of the most perfectly and beautifully depicted flowers in the entire series, even though only half a plant is represented. It is the common dandelion, *Taraxacum officinale.*

Many of the flowers in these two tapestries are easily recognized. Some of them occur in slightly different form throughout the series. To speak of some of the more conspicuous among them, the English bluebell (*Scilla nonscripta*) is one of the most frequently repeated, occurring in blue, pink, yellow, and white, sometimes in flower, often as not in fruit of equally varying color. The English daisy (*Bellis perennis*) is almost as frequently shown, in white, pink, and yellow, but always in such distinctly characteristic form of flower and leaf as to indicate that the color was varied merely for effect.

Two types of viola are represented with colors corresponding to those of the scilla. It seems reasonable to believe that all of those with rounded leaves are intended, despite their hues, for the sweet violet, *Viola odorata.*

THE UNICORN IN CAPTIVITY A PORTION OF THE SEVENTH TAPESTRY

Prominent against the enclosure are a carnation, a purple iris, and a stock, while against the unicorn's body are an orchid and a scilla. Just above the animal's right foreleg another scilla is beautifully depicted in fruit. To its left is the only representation of the bistort, on both sides of the corral is the broad-leaved pink, Dianthus Seguieri. Just inside the front of the enclosure is the cuckoo-pint, or lords-and-ladies. An exceptionally fine sweet violet shows at the rear. Among the flowers which the close observer will see in the foreground are the dame's rocket, strawberry, vinca, pansy, campion and holy or St Mary's thistle.

Those with long leaves toothed in various fashions and with flowers borne on leafy stems are thus plainly intended to represent the pansy (*Viola tricolor*), which even in the wild state occurs in numerous combinations of color and with considerable variance both in the width and toothing of the leaves.

Strawberries, shown with both flowers and fruits, are beautifully drawn. The narcissi are equally perfect, always in yellow and unmistakable. Their fruits, seldom observed in gardens, are shown in light blue, perhaps to represent the glaucous bloom which covers the pods. Most of them have the characteristic pear shape, but some, even on the same plant, are curiously elongate. This may have been done for the purpose of filling small spaces to better advantage of balance.

The primroses represented in the first and seventh tapestries are all shown with yellow or orange flowers, while some of those in the other four large panels are of pink or red. Since the primroses with reddish tones are all high mountain species, and only lowland plants seem to be depicted in the tapestries, one must again allow for artist's license or assume that the designer was a traveled man who indicated here colors that he had seen in other regions.

The periwinkle (*Vinca*) is easily identifiable as it appears only in the two normal colors of white and blue, always with opposite leaves, and in 1 and 7 (not elsewhere) with a pair of terminal tendril coils. These tendrils do not belong on the plant, but it must be supposed that they were placed there to indicate that the vinca grows like a vine—though it is more properly a creeper.

The white campion (*Lychnis alba*), whose untoothed opposite leaves and white flowers make it easily distinguished, is recognized in several of the tapestries.

There are a number of plants of the Mustard family (*Cruciferae*) represented in all of the hangings. Some of them in Tapestries 2, 3, 4 and 6—the smaller ones with red, orange, or yellow flowers—can not be positively placed except as to family. The others—that is, the larger ones—are more definite. As stocks (*Mathiola incana*) and wallflowers (*Cheiranthus Cheiri*) they are among the most conspicuous of flowers in all the series. In the weaving they look much alike, but the stocks have slightly larger flowers in white, pink, and pinkish red, and leaves more blunt-tipped and "floppy" and a bit more bluish green, while the wallflowers are in yellow, orange, and orange-red and have leaves somewhat pointed and stiff and more definitely green. The two blue-flowered crucifers, both shown with toothed leaves, are more clearly distinguishable. The dame's rocket or dame's violet (*Hesperis matronalis*) has taller stems, narrower, longer leaves, and much larger flowers than the other, which is apparently honesty (*Lunaria*) with small flowers on short spikes and with much broader leaves. In nature, both are purplish in hue instead of blue.

TWO OF THE MYSTERIES IN THE FLORA OF THE UNICORN TAPESTRIES
The curious flower (or fruit) at the left appears twice in pink and white in the seventh. The pendulous spikes are found in the first near a tree trunk at the extreme right.

A study of the background of the four hangings which follow the first one on the long wall in the tapestry hall gives one a glimpse of the edge of a typical forest in western Europe, for here are the oak, the elm, the holly, another tree which is probably a beech, and in front of these, smaller trees and shrubs.

The holly is easily recognized by its red berries and spiny leaves; the oak by the characteristic shape of its leaves, some of which are spotted with reddish galls. In the elm the foliage is indistinct, but the shape of the tree is unmistakable for, though the branches are more stiff, they have an upward sweep not unlike that of the American elm. The fourth tree has been a puzzling one throughout this study, for its glossy-appearing oval leaves have not been confined to this subject alone. Out of the many suggestions made, our decision to call it a beech was based mainly on its natural prevalence among oaks and elms in a forest, though we were guided somewhat by the weaver's implication of smooth bark. In the fourth tapestry one of these trees has just been cut down, perhaps to be fashioned into a staff.

All of the tapestries except the second and sixth have a tree as the central feature, and in each a different kind is shown. In the third it is an oak (*Quercus Robur,* as undoubtedly are the rest), and to its left appears the first new tree in the forest scene. The large blue-black fruits indicate that it is the bullace plum, *Prunus institia.*

In Tapestry No. 4 the central tree is unmistakably an orange, easily recognized here, as it is in the lower right corner of No. 2, by its winged petioles (leaf-stalks) and the presence of flowers and fruits on the branches at the same time. To the right of the central orange is a walnut tree well laden with large brown nuts. Beside it, bearing small red fruits, is a tree that has been a problem, for it does not fit into any forest scheme of the region concerned. We are therefore inclined to accept Mrs. Marquand's suggestion that it is a strawberry tree (*Arbutus Unedo*). While extremely rare in the wild on the European continent, it has been cultivated there for so many centuries that the designers could easily have considered it familiar enough to be included among the forest trees.

In the upper right-hand corner of this same tapestry is a tree with richly colored fruit that is probably an apricot.

One of the two fragments of the fifth tapestry, which hang above the door, contains the only apple tree shown in the series. This was the central feature of the original tapestry and was identified by Mrs. Marquand as a pomegranate, but a comparison with the pomegranates in the two other tapestries (3 and 7) reveals a totally different structure of the fruit. The design of these fragments is marked by the stronger light which is thrown against the figures, and in the original this brightness was brought out in the apple by the golden threads which were used to indicate highlights. The threads are now browned with age, so it is only at close range that the true form of the apple, with a prominently marked blossom end, can be distinguished. Several oaks, a holly, a branch of beech, and a few small leaves of walnut are the only other trees shown in the fragments. Most prominent is a row of red and white roses twining about the en-

closure wherein the unicorn has been captured by the virgin. The only flower shown is a bit of periwinkle.

The sixth tapestry in the series (the fifth in the order of hanging) again shows the forest trees to be oak, holly, beech, and elm.

The shrubs or forest undergrowth forming the middle ground and the dominant notes at the lower corners are, like the trees, quite similar throughout the four central tapestries.

Most frequently depicted is the hawthorn in full flower, exquisitely designed, and accompanied by shrubby specimens of oak and holly, one of

DETAIL FROM THE LOWER LEFT CORNER OF TAPESTRY No. 6

One of the most gracefully woven plants in the Unicorn series is the blackberry which is shown climbing over the branches of a hazel. At its right is a well drawn bearded iris.

FLOWER DETAILS FROM THREE OF THE TAPESTRIES

At the left is the common yellow iris which is growing beside the stream in Tapestry No. 3. Immediately below are shown five flowers from directly above the plume of the left-hand huntsman in the first. The central plant is the only hawkweed depicted. In the upper left and lower right corners are English daisies. Above at the right is one of the many violets; below at the left, one of the English bluebells. In the picture below is the one example of the clary, from Tapestry No. 3; beside it the common ox-eye daisy. In the lower right corner is the one feverfew, a plant that is recognizable in one's first glance at the fourth tapestry.

the former bearing the typical acorns of the English oak. There are also plums, cherries, hazelnuts, and a beautiful blackberry climbing over the branches of one of the hazels. A noteworthy tree is the medlar (*Mespilus germanica*), whose fruit is almost unknown in America, though common in Europe for many centuries. It is related to the apple and is marked by a greatly enlarged blossom end. Most notable of all is the single pomegranate tree near the lower left corner of the third tapestry. Here, in contrast to the seventh hanging, the tree is correctly drawn, telling us plainly that the designer must have been familiar with it as it grew, not with its fruits alone.

The only occurrence of the peach tree is at the lower right of Tapestry No. 4, where the large grooved fruits are easily recognized. In front of the fountain in the second tapestry and below the head of the unicorn in the fourth is an old-fashioned cabbage rose of the type once widely cultivated in Europe and America, but now displaced by newer-bred forms.

Flowers—that is, herbaceous plants—appear only in the foreground of these four principal scenes of the hunt. Here we have some of the most interesting, most obvious, and some of the most difficult in the entire series to identify. Certain ones are present in all four of the scenes, foremost being the pot-marigold (*Calendula officinalis*), correctly and unmistakably drawn. Also present in Tapestries 2, 3, 4 and 6 is the winter-cherry or Chinese lantern plant (*Physalis Alkekengi*), conspicuous by the bright red husks which cover its fruits. This plant, while native from the eastern Mediterranean to Japan, had been cultivated for so many centuries in Europe that it would have been as familiar a plant in that day as it is to us now in America.

Some of the plants shown reveal an acuteness of observation that is equaled only by the perfection of workmanship in the weaving. A glance at the plantains (*Plantago Cornuti*) in the third and fourth tapestries, the cat-tails (*Typha latifolia*) in the water toward the right side of the fourth, and the feverfew (*Chrysanthemum Parthenium*) near the stream in the lower left of No. 4 show both designer and worker at their best.

In the daisy-like plants, or composites, however, their eyes were more confused. There is not the differentiation that would be expected in depicting these familiar flowers of the field and open woods. However, it is quite apparent that they intended to show in the third tapestry, for example, the ox-eye or common field daisy (*Chrysanthemum Leucanthemum*), the corn-marigold (*Chrysanthemum segetum*), and a groundsel (*Senecio paludosus*). The daisy is also prominent in the fourth.

This tapestry, in which the unicorn is shown defending himself, contains a larger number of puzzling plants than any other. Several of them show only leaves, but even they are quite different in form from those seen anywhere else. Two with flowers are, however, equally conjectural,

1. *The cherry which forms the central feature of Tapestry No. 1.*
2. *The blue plum at the edge of the forest to the right.*
3. *The holly and pomegranate from the lower left corner of No. 3.*

TREES OF THE UNICORN TAPESTRIES

A selection of six of the seventeen that appear.

4. *A portion of one of the medlars, from Tapestry No. 2.*

5. *The head of the orange tree, in flower and fruit, in the lower right corner of No. 2.*

6. *The peach tree which occupies the lower right corner of the fourth tapestry.*

though the leaves of one indicate that it may be a thistle in bud. The other has rather broad, unindented leaves and at the tip of each branch a blob of purplish color that might be either a flower or a fruit.

In all of the hangings only three members of the Mint family appear, the field mint (*Mentha arvensis*) rather inconspicuously placed in the first tapestry, the common sage (*Salvia officinalis*) prominently set against the fountain in the second, and clary (*Salvia Sclarea*) centrally located near the base of the oak in the third.

At the water's edge near the lower right of the third is the yellow flag (*Iris Pseudacorus*). This same iris in an orange tone appears also in the fourth. Mrs. Marquand has called these plants the yellow and orange daylilies (*Hemerocallis*) but the reflexed sepals and erect petals used elsewhere for an iris have also been used here, while lily-like flowers have been shown in their true form on the one Madonna lily. Moreover, it is very doubtful that daylilies were known in western Europe at that period.

Under the right-hand hunter in the third tapestry is an unfamiliar-looking blue flower with cut leaves. This is probably *Nigella arvensis*, which lacks the feathery involucre so familiar in our garden plant called love-in-a-mist (*Nigella damascena.*) While nigella leaves are actually cut into thread-like segments, the type of weaving here necessitates the making of coarser leaves so that they will be visible. In the fourth and sixth tapestries plants of a similar design appear both with yellow and with red flowers, in one instance on the same plant. These we assume are meant for the pheasant's-eye (*Adonis aestivalis*), whose flowers occur in both these colors.

Below the lower left "A" in the third tapestry is the only forget-me-not in the entire series.

Besides a handsome bearded iris, standing erect in the foreground, and the usual ground-cherries, pinks, primulas, pansies, violets, and campions, the sixth tapestry brings two newcomers to the scene: one the safflower (*Carthamus tinctorius*), the "scarlet thistle" of Mrs. Marquand; the other a relative of the pinks and campions, but a plant wholly unknown in America, hence without a common name here. At the top of the stem it has white flowers with cleft petals and on the lower branches enlarged calyces from which the berry-like fruits have evidently fallen. If our assumption is correct, its botanical name is *Cucubalus baccifer*.

The restorations, which are best discounted in the final analysis of plants represented, nevertheless, demand attention. The large areas woven in across the bottom of the first and seventh contain only plants depicted elsewhere in the same two tapestries. A careful survey will locate the original of the design for each plant, though the newer work is inferior and the colors are less brilliant.

PLANTS WHICH BORDER THE STREAM IN TAPESTRY No. 4

Left to right, in the extreme foreground, are seen the broad-leaved pink, an unidentified plant with rounded purplish flowers or fruits, the ox-eye daisy, English bluebell, a stock, primula, English daisy, yellow iris, "Canada" thistle, and narcissus. On the far side of the stream are the pansy (though an unusual specimen of it), feverfew, plantain, several small plants, then the ground-cherry, violet, and another pansy. Farther back in the picture may be seen stocks, adonis, strauberries, and a rose, with a plum, hawthorn, and medlar showing in the background toward the left.

The cluster of iris, for example, in the new work on No. 1 is a complete copy of the original in No. 7, even to the placing on the left-hand spray of two unnatural flowers. In addition, a butterfly on one of the iris flowers in the restored portion is clearly a copy of one on the carnation beside the iris in No. 7. The calendula which appears twice on the piece across the bottom of No. 1 and once on No. 7 seems to have no exact original, but near the lower right-hand letter, and again several plants away to the left on No. 7, appear two specimens that are obviously the same plant less conventionalized. These are probably the designer's source for the restoration. The other plants in these restorations are too easily identified to call for discussion in detail.

The patch in the lower right corner of the fifth tapestry is of little or no importance, for its inferior execution and the totally foreign nature of the plants represented is quite out of keeping with the tapestries otherwise. The picturing of the garden pea and the red pepper is interesting, however, as this is the only appearance of vegetables in the series, and here only in a patch of much later date than the original. The muskmallow also is shown here but nowhere else.

At the left edge of the patch, below the lady's robe, the presence of the safflower, beautifully worked out but partially obliterated, makes one wish for the remainder of the original part of this corner. That longing, however, must remain forever ungratified.

The more one gazes at the original work in these superb tapestries, the more familiar flowers one discovers—and the more one marvels that a designer who could conceive the grandeur of the drama of the unicorn hunt for the weavers to reproduce could at the same time suggest the details of more than 100 kinds of flowers—most of which were reproduced with an accuracy, even a feeling for form and texture, that might well be the envy of an artist or an artisan today. Perhaps even a greater wonder is that a band of weavers could carry out to such perfection the flower petals, veins of leaves, thorns and other such fine details, with a precision of line and color that in most of the plants is unassailable.

The Unicorn tapestries at The Cloisters in New York stand alone for their magnificence, their perfection. To those of us who have closely studied the plants depicted in them, that perfection reaches its height in the flowers, shrubs, and trees. Plant illustration as shown in books of the fifteenth and sixteenth centuries was crude. In the accurate representation of plant life, the weavers' skill in these tapestries represents the highest art form of the period.

In a forthcoming number of the Journal there will be a drawing of each different kind of plant depicted in the Unicorn tapestries, with a complete reference list of names so far as these plants can be identified.

Ferns Of The Desert

By Ira L. Wiggins
Dudley Herbarium
Stanford University

A SUN-BAKED LAND like the deserts of Lower California would scarcely be expected to yield ferns and fern relatives, but a slightly known fern, *Cheilanthes Brandegei,* described from specimens collected on Magdalena Island and previously known only from that locality and from Cedros Island* was discovered in 1935 growing in comparative abundance nine miles east of Punta Prieta, in the central part of Lower California. The colony was located on the north slopes of a steep volcanic hill, the fragile fronds standing out in bold green contrast against the somber reddish brown of the basalt. A few days later it was found again among volcanic rocks at the head of the grade leading down Escondido Canyon, a few miles southwest of Punta Prieta. It was also collected near Calmallí in the spring of 1935 by Dr. Carl Epling. These three collections were the first to be made on the mainland of the peninsula, and extend the known northern limit of its distribution about sixty miles.

Cheilanthes Brandegei has small fronds that, in our specimens, rarely exceed five inches in height. A scattering of coarse, though fragile, hairs occurs on the lower surface of the reniform to ovate segments of the crisp blade. The stipes are extremely brittle, having transverse zones of weakness near their bases. These weak zones behave like the abscission layers across the petioles of leaves when subjected to lateral stress. As herbarium specimens dry these zones become visible as small transverse grooves, from one to eight developing in the basal part of the stipe. It is the only known species of *Cheilanthes* in the Sonoran Desert that exhibits such modifications.

The desert is scarcely considered a suitable collecting ground for one interested in ferns, and would seem to be particularly unfavorable for *Marsilea.* However, there is a flat about twenty miles south of Calmallí where shallow pools of rainwater collect during the winter of years with good rainfall. Here specimens of *Marsilea Fournieri* bearing numerous sporocarps were collected in 1931 and again in 1935. Some of the plants grew within three feet of the base of *Pachycereus Pringlei,* one of the giant cacti called "cardón" by the Mexicans.

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* Eaton published it as coming from Magdalena and San Benito Islands. Eaton, D. C. A New Fern. Bull. Torrey Club **17**: 215. 1890.

For previous articles written by Dr. Wiggins on the flora of Lower California, see this Journal for September and November 1940, also August 1939.

The Dogwood's Curious Floral Bracts

By Theodor Philipp Haas

THE latter half of April and the early part of May the parks and woods throughout the East are ablaze with the flowers of dogwood (*Cornus florida*), one of our showiest trees. We say "flowers," but the true flowers are inconspicuously clustered in the center of the four large bracts which give the tree its whole effect.

FLOWERING DOGWOOD SHOWN IN THREE STAGES OF UNFOLDING

At the left, with winter scales just beginning to separate. Center, the new growth at the base of the scales expanding as greenish bracts. Right, the bracts white and fully expanded—the dogwood in full flower.

These showy bracts are actually leaves; that is, considerably modified leaves with a unique structure and veining. In a normal leaf we can distinguish three parts: (*a*) the base by which the leaf is attached to the twig; (*b*) the petiole or stalk by which the leaf may be oriented into a favorable position as regards the light; and (*c*) the green leaf-blade, one function of which is to utilize light in the manufacture of starch that is used in the growth and development of the whole plant.

These modified leaves of the flowering dogwood differ in four major ways from the plant's green leaves. (1) They do not have the 3 sections characteristic of a normal leaf. (2) They are not green, hence are not concerned with the usual function of starch production. Their chief usefulness seems to be to attract the insects which are essential for the pollination of the flowers. (3) They grow in different manner, a normal leaf expanding at the outer edges, but this particular one growing only from the base. (4) The green leaves of dogwood have a mid-rib which appears to be an extension of the petiole, with side veins running into it in feather fashion, but the floral bracts are lacking the mid-vein, and instead of a feathered system, they have more or less parallel veins running from the tip to the base, the outer ones following the side margins.

The tip of each bract is a structure of peculiar interest, for it is much more than a decorative indentation. In summer, when new buds are being formed for the following year on any woody plant, they are ordinarily covered with scales which protect them during the winter from drying up. These scales themselves are modified leaves, and in the flowering dogwood, where they occur in pairs, they are brownish in color, thick-skinned, and the outer of the two pairs is quite woody, the inner slightly so. They are thought to be overdeveloped leaf-bases, the petioles and blades being atrophied.

In April the basal part of each of these sheathing leaves begins to grow, pushing the brownish scale ahead of it. At first the new tissue formed is light green, then as the leaves expand and flatten out to their full magnificence, they gradually turn white through the reflection of light from the air contained between the cells. The original base which formed the bud-scales during the winter desiccates and forms the characteristic woody depression at the tip of each of the two opposite pairs of bracts.

Thus, the floral bracts fulfill two special functions: in winter, as scales, serving for the protection of the flower-buds; in spring forming the spectacular portion of the inflorescence that is the prelude to pollination.

Reviews of Recent Books

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Valuable Source Book

THE MERCK INDEX. Fifth edition. Compiled by the technical staff of Merck & Company. 1060 pages Merck & Company, Rahway, N. J., 1940. $3.

Merck's Index has long been known to the worker in chemistry but its use by botanists has been overlooked. No one can handle plants without being confronted with the problem of the chemistry involved. What does this chemical compound do? What does this drug contain in the way of useful products? In the new edition of Merck's Index there are 5,900 descriptions of individual substances. This information is concise, giving the name of the substance, its source, chemical formula (if organic the structural formula is given), boiling point, melting point, solubility, uses, and in many cases the references to the literature are noted. Nearly 600 pages are given to this part of the volume.

The second part of the book deals with 4,500 chemical, clinico-chemical reactions, tests and reagents by the author's name; formulas for the preparation of culture media, fixatives and staining solutions; useful tables; antidotes for poisons; literature references and other valuable information.

It has been possible to offer this unusual source book to the public at a low price because it has been established on a nonprofit basis.

WILLIAM J. BONISTEEL,
Fordham University.

Problems of the Negro Farmer

PLOWING THROUGH. The Story of the Negro in Agriculture. Edwin Ware Hullinger. 60 pages, illustrated William Morrow and Co., New York, 1940. $1.50.

This is a very brief account dealing primarily with the social problems of the Negro farmer, profusely and excellently illustrated with photographs taken by the United States Department of Agriculture. The author is an experienced journalist and neither an agriculturist nor an agronomist and he is here concerned with problems that are social and economic rather than agricultural; he deals not with farming as such but with the plight of the Negro farmer.

His treatment of the subject is fair and sympathetic throughout but he fails to emphasize the fact that the problems of the white farmer in the same sections of the country are identical with those of the Negro farmer and that these problems are regional rather than racial.

Particularly timely is his exposition of the aid now being received by the Negro farmer from governmental agencies.

ARTHUR B. SPINGARN, *President, National Association for the Advancement of Colored People.*

The American Scene In An Earlier Day

AUDUBON'S AMERICA. The Narratives and Experiences of John James Audubon. Edited by Donald Culross Peattie. 329 pages and 17 facsimiles of Audubon's prints and paintings. Houghton Mifflin Co., Boston, 1940. $6.

Never have Audubon's colorful and vigorous descriptions of the America of the early 1800s been more attractively offered to the general reader than in this handsome 8 x 12 volume. Selecting his material from Audubon's "Ornithological Biographies," and "Quadrupeds of North America" as well as from various published diaries and journals, Mr. Peattie presents for the first time the cream of Audubon's writings and art in a single unit.

A few of the individual bird and mammal biographies, a great many of the delineations of the American scene, and some brief excerpts from the travel journals make up the bulk of the book. By means of careful selection and the use of introductory comments preceding each group of quotations, a very effective cohesion is obtained. These introductory

remarks and the biographical chapters at the beginning reveal Mr. Peattie's intimate knowledge not only of Audubon's life but the period of American history in which he lived, and furnish a setting for the quotations which greatly adds to their interest and readability.

The illustrations, mostly 12 by 16 inches in size, include birds, mammals, a landscape and a self portrait. In quality of reproduction they are far superior to others which have appeared recently.

RICHARD H. POUGH,
National Audubon Society.

Notes on Some of the Books Of the Past 18 Months

Space limitations necessitate the briefest possible comments on the great majority of books received for review by the Journal of the New York Botanical Garden. It is the desire, however, to keep Journal readers informed so far as possible on all recent literature concerned with plant life. In the following notes, which are grouped by subject, an attempt has been made to give a concise report on the contents and scope of each book.

Books for Gardeners

DO YOU KNOW YOUR GARDEN? Gladys M. Goshorn. 310 pages, indexed. Oxford University Press, New York, 1941. $2.50.

A question-and-answer book on many phases of gardening, garden history, and garden lore, which has the same sort of appeal as the informational radio programs.

SUNSET'S VISUAL GARDEN MANUAL. Elsa Uppman. 149 pages, illustrated, indexed Lane Publishing Co., San Francisco, 1941. $1.

Black and white sketches, six to a page, illustrate methods for raising many kinds of plants and performing numerous garden tasks following instructions given by the director of California School of Gardening.

GARDEN GUIDE. The Amateur Gardeners' Handbook Edited by A. T. DeLaMare and staff. 559 pages, illustrated and indexed. De La Mare, New York, 1940. $2.

The seventh edition of an old stand-by for the American gardener.

THE HOME GARDENING ENCYCLOPEDIA. Walter Brett. 448 pages, illustrated. Chemical Publishing Co, New York, 2nd edition, 1940. $2.50.

A small encyclopedia suitable only for the English climate.

PLANT PROPAGATION. Alfred C. Hottes. 228 pages, illustrated and indexed De La Mare, New York, 2nd edition, 1940. $2.

A concise and useful manual in a new edition.

GARDEN MAGIC. Roy E. Biles. 307 quarto pages, illustrated and indexed. J. G. Ferguson, Chicago, 1941 $3.

Two pounds and nine ounces of information for gardeners, in 27 varied chapters chiefly illustrated by drawings and charts, but interspersed with eight dazzling full-page color plates.

THE GARDEN BEAUTIFUL IN CALIFORNIA. Ernest Braunton. 213 pages, illustrated and indexed. Times-Mirror, Los Angeles, 1940. $1 75.

A guide for the home gardener on the western coast.

A PLANT HANDBOOK. Harriet B. Creighton and Priscilla Pasco 47 pages The Connecticut Arboretum at Connecticut College, New London, Conn., 1940. 60c.

A conveniently tabulated guide to hardy woody plants under 16 such headings as Plants for Winter Interests, Rock Garden Plants, Ground Covers, Plants Tolerant of Seaside Condition.

THE PLANT DOCTOR. Cynthia Westcott. 297 pages, illustrated and indexed. Frederick A Stokes, New York, 2nd edition, 1940. $2.

How to keep the garden in good health retold with the addition of the experience of the past four years.

Of Interest to Botanists

THE FERNS AND FERN ALLIES OF WISCONSIN. R M. Tryon and others. 158 pages, illustrated and indexed Department of Botany, University of Wisconsin, Madison, May, 1940 $1.

This manual combines scientific accuracy and thoroughness with popular treatment. There are extensive keys to the families, genera, and species, and detailed descriptions, accompanied by excellent diagrams, photographs, and maps showing distribution in the state. The usual miscellany of clubmosses and horsetails is included.

A CONTRIBUTION TOWARD A BIBLIOGRAPHY OF OREGON BOTANY. With Notes on the Botanical Explorers of the State. Katherine Whipple Hughes. 93 pages, mimeographed. Oregon State System of Higher Education, Eugene. 1940. 50c.

A mimeographed reference work arranged alphabetically by authors to works on the plant life of Oregon.

A HISTORY OF SCIENCE IN CANADA. Edited by H M Tory. 1[illegible] pages, illustrated and indexed Ryerson Press, Toronto, Canada. $2.50.

Geology, chemistry, botany, zoology, medicine, astronomy, mathematics and physics treated, each by a different author, who tells of the development of each of these sciences in Canada. The section on botany is done by Frère Marie-Victorin.

TREES OF SANTA BARBARA. Maunsell Van Rensselaer. 142 pages, illustrated and indexed Santa Barbara Botanic Garden, Santa Barbara, Calif. 1940. 85c.

Reproductions of photographs of exceptional quality with drawings and descriptions or notes on 550 species

SOME FOSSIL PLANT TYPES OF ILLINOIS. Raymond E Janssen. 124 pages, illustrated and indexed Illinois State Museum, Springfield, 1940. $1.25.

The first of a series of scientific publications being issued by the Illinois State Museum, the present one offering records, photographs, descriptions, discussions, and conclusions regarding nearly 60 fossil species of plants.

TEXTBOOK OF PALEOBOTANY. William C Darrah. 441 pages, illustrated and indexed. D. Appleton Century, New York, 1939. $6.

A notable series of biological text books adds a volume by Dr. Darrah of Harvard University. The 23 chapters fall into four sections: General Principles, The Paleontological History of the Vascular Plants, The Succession of Ancient Floras, General Results. The author points out in his conclusion that, during the past 25 years, paleontologists, partly because of the shift of emphasis from descriptive morphology and taxonomy to physiology, morphogenesis, and genetics, have held to their older concepts rather than embrace newer ones. Moreover, he remarks that "the older concepts still seem to 'explain' the fossil record as it stands."

For Nature Students

A NATURALISTS' DIRECTORY. E. W. Cassino. 292 pages, indexed The Naturalists' Directory, Salem, Mass. 32nd edition, 1940 $3.

A familiar address book for, by and of naturalists, with the addition of a list of periodicals and museums concerned with natural history.

LEARN THE TREES FROM LEAF PRINTS. David S. Marx. 38 folio pages, illustrations without text Indexed. The Botanic Publishing Co, Cincinnati. Fifth printing, 1940. $2.

Full-sized leaf prints of 194 trees in which details of veining stand out clearly. Five plates showing the tips of branches of conifers, and one plate showing the needles of pines have been added since the book was first published in 1938.

THE AMERICAN BOOK OF THE WOODS. David S. Marx, 45 folio plates with accompanying descriptions, indexed. Botanic Publishing Co, Cincinnati, 1940. $2.

Leaf prints and brief descriptions from the point of view of usefulness of more than 250 plants to be found in the woods of central United States.

ABOUT SPIDERS. Introducing Arachne. Elaine V. Emans. 183 pages, illustrated and indexed. Dutton, New York, 1940. $2.50.

A book for the novice in entomology which makes the spider fascinating instead of frightening.

A FIELD KEY TO OUR COMMON BIRDS. Irene T. Rorimer. 160 pages, illustrated and indexed. Cleveland Museum of Natural History, 1940. $1.50.

A pocket guide with thumbnail-size colored illustrations.

JOHN KIERAN'S NATURE NOTES. John Kieran. 112 pages, illustrated by Fritz Kredd. Doubleday, Doran, 1941. $1.50.

A star of "Information, Please" writes some entertaining random paragraphs about a few of the plants and animals that he knows.

THE LAYMAN SCIENTIST IN PHILADELPHIA. W Stephen Thomas. 44 pages, illustrated. The American Philosophical Society, Philadelphia, 1940. 15c.

A handbook prepared especially for and about the amateur, showing the extensive opportunities in and around Philadelphia for the pursuit of science, and the great response that is given in that city to the public services offered by scientific institutions and organizations.

Observations on American Plants

THE TRAVELS OF WILLIAM BARTRAM. Edited by Mark Van Doren. 414 pages, indexed. Facsimile Library, Barnes & Noble, New York, 1940. $2 75.

A new edition of one of the eighteenth century's most popular and influential writers, a man whose career, with that of his father's, is even today rivaling in attention that of some of the twentieth century's explorers.

PLANTS USED AS CURATIVES BY CERTAIN SOUTHEASTERN TRIBES. Lyda Averill Taylor. 88 pages, indexed. Botanical Museum of Harvard University, Cambridge, 1940. $2.

A survey of native medicinal plants of southeastern United States with a remarkable chart showing the acknowledged medical usefulness of the majority of remedies used by the Indians.

Books for Children

MR. BAXTER'S DANDELION GARDEN. Jeannette C. Shirk. 60 pages, illustrated. Dutton, New York, 1940. $1.50.

A children's story delightfully illustrated by the author.

THE SEASONS AND THE GARDENER. H. E. Bates. 69 pages, illustrated by C. F Tunnicliffe, Cambridge University Press, 1940. $2.

The sort of a book that makes a grownup wish he were a child, so that people would write and draw pictures especially for people of his age in such a gentle, entertaining way.

AMERICAN WILD FLOWERS. Cecile Hulse Matschat. 17 plates in color with accompanying text. Random House, New York, 1940. 50c.

A score of the old familiar colored plates that were first used by Homer House for his Wild Flowers of New York in 1919, now somewhat the worse for wear, accompanied in this book by brief descriptions written for children.

See also some of the books listed ***For Nature Students.***

Purely for Pleasure

THE BOOK OF HERB COOKERY. Irene Botsford Hoffmann 251 pages, indexed. Riverside Press, Chicago, 1940. $2.50.

The answer to that insistent question, "But haven't you a book that tells you how to *use* these herbs?"

ARRANGING FLOWERS. Margaret Watson. 65 pages, illustrated. The Studio Publications, Inc., New York and London, 1941. $1 50

A handful of hints, followed by 26 photographs of arrangements with a paragraph on the plants that appear in each.

GARDEN CLUBS AND SPADES. Laurence McKinney 64 pages, illustrated by Helen E Hokinson. Dutton, New York, 1941. $1.

A humorous book containing prose and verse interspersed with drawings by one of the most popular of the *New Yorker's* cartoonists.

BEAUTY IN NATURE AND ART. Edward Howard Griggs. 72 pages, illustrated and indexed. Bobbs-Merrill, New York, 1940. 75c.

A small inspirational book by a popular radio lecturer.

STONES FOR MY POCKET. Marion Lee. 74 pages, illustrated. Kaleidograph Press, Dallas, Texas, 1940. $1 50.

A small book of verse, partly about flowers.

HERBS FOR URBANS AND SUBURBANS. Katherine van der Veer 95 pages. Loker Raley, New York, 1940. $1.50.

The recipes are excellent—more excellent than a botanist would believe when he discovers that about 40 percent of the botanical names of herbs that are used have been misspelled.

Life Job

YOUR CAREER IN AGRICULTURE. Homer Paul Anderson. 285 pages, illustrated and indexed. Dutton, New York, 1940. $2

A man apparently of long experience both with farming and with boys emphasizes the value of study and the application of practical science to insure success in an agricultural career. He outlines many types of jobs, telling of their requirements in knowledge or skill, their advantages (or disadvantages), and the income that they are likely to provide.

For the Trade

SEED TRADE BUYERS GUIDE & DIRECTORY. 210 pages, illustrated and indexed Seed World, Chicago. 24th edition, 1941. $1.

An invaluable reference for dealers who wish to buy seeds, plants, and many different kinds of equipment for gardening, farming and allied activities.

Present and Future Control Of the Japanese Beetle

By B. O. Dodge

THE importance of combating the Japanese beetle with every means that has been proved practical makes the report on "Japanese Beetle Control with Natural Enemies" by Edward H. Smith, appearing in *Farm Research* for April 1941 of particular significance.

In this article Doctor Smith has reviewed briefly the history of the introduction of the Japanese beetle and the work that has been done by the Federal and State authorities on its control. In eastern Asia, where the beetle is present but not a serious menace, natural enemies of the insect have, through many years, developed efficient control.

It has been found in America that Tiphia parasites, which resemble winged black ants about ¾ of an inch long, burrow in the ground and lay their eggs in the beetle grubs. The Tiphia larvae are white plump grubs, having much the appearance of the larvae of the narcissus bulb fly. (Several years ago in making a survey for the presence of the grubs of Japanese and Asiatic garden beetles, and other larvae that were destroying our lawns at the Botanical Garden, a number of native Tiphia larvae were found feeding on beetle grubs. They were not sufficiently numerous, however, to be of any importance.)

Lately a much more promising biological control has been found to be a bacterial organism which causes a "milky disease" of the larvae. This bacterium is a spore-former and, therefore, the organism can live over for a long time in the soil in the spore stage. Grubs attacked show a milky appearance of the blood, which is normally colorless.

The New York State Department of Agriculture, working through the U. S. D. A., has distributed in certain localities heavily infested with the beetles, colonies of the Tiphia as well as a dust containing the spores of the bacterium. While Doctor Smith says it is too early to really determine the effectiveness of these two agents of control, they are both promising: "The question no doubt arises as to the ultimate value of biological control in the case of the Japanese beetle. Although it is not anticipated that this pest will be exterminated by insect parasites and bacterial disease, it is believed that the combined action of these factors may reduce the Japanese beetle population to a point where it will cause far less damage than might otherwise occur."

It appears then that until much further experimental work is done we must rely principally on make-shift methods, such as applying ten pounds of powdered arsenate of lead to each 1,000 square feet of lawn surface to destroy the grubs, and using repellents and poisons to keep the adult beetles from attacking our favorite ornamentals.

Current Literature At a Glance*

Botanical Garden. An eight-page illustrated reprint from the March number of *Parks & Recreation* describing the New York Botanical Garden is available.

Giant Trees. The largest specimens in America of eighty different kinds of trees are listed in the April number of *American Forests.* The frontispiece for the month is the Dorrington sugar pine in Stanislaus National Forest, California. Further reports on big trees of America are requested by the magazine.

Leaf Ailments. Dr. P. P. Pirone of New Jersey initiates a series of articles entitled "Diagnosis of Tree Disorders" in *Trees* magazine for March & April. The opening number deals with leaf troubles.

Woody Plant Lists. Sources of trees and shrubs in American Nurseries are being printed in *Arnoldia*, which is a new name for the Bulletin of Popular Information of the Arnold Arboretum of Harvard University. In No. 4 of Volume 1 a supplementary list for Buxus, Cotoneaster, Hibiscus, Ilex, Magnolia, Philadelphus, Picea, Rhododendron, Azalea, Rosa, and Syringa is printed.

Elm Disease. Further information on the habits and habitats of the beetle which carries the Dutch elm disease is contained in Bulletin 740 of the Agricultural Experiment Station at Cornell University.

* All publications mentioned here—and many others—may be found in the Library of the Botanical Garden, in the Museum Building.

Outdoors. Inveterate campers as well as novices will enjoy the 32-page pamphlet "Outdoor Living," which appears as one of the Cornell Rural School Leaflets. Approximately every other page contains helpful illustrations to make a season of living outdoors simple and safe.

Japanese Beetles. Instructions for the use of traps against the Japanese beetle are contained in Circular 594 of the United States Department of Agriculture.

Marsh Life. Plants and animals of marshlands are featured in *Nature Magazine* for April. The educational insert for the month is by E. Laurence Palmer of Cornell University and deals with the life in marshlands and their environs.

Daylilies. Two reprints have been received from Volume 7 of *Herbertia*, one on "Foliage Habits of Daylilies" by A. B. Stout and one which includes a chart on "Flowering Periods for Clonal Varieties of Daylilies" by Selma C. Kojan, who carried on the investigation with a summer scholarship under the direction of Dr. Stout.

Blooming Dates. Data on the opening of petals and the shedding of pollen in 40 common wild flowers growing within 30 miles of Philadelphia are being collected by amateur observers working under the direction of the American Philosophical Society's Committee on Education and Participation in Science. Observers are provided with a "log" on which to record the dates and weather conditions after the name of each plant. For this, the second year that observations are to be made for the committee, a separate list of 151 cultivated plants has been prepared, and gardeners are being asked to record their observations on the dates of the unfolding of the leaves, the first opening of the petals, the height of bloom, and the end of the flowering period.

Two in One. *Seed World* and the *National Seedsman* have been combined into one semi-monthly periodical, to be issued under the name of *Seed World* with R. C. Helgeson, formerly editor of *National Seedsman*, directing the magazine. W. L. Oswald, who for many years had been editor of *Seed World*, is retiring.

Martinique. Henri Stehlé has contributed "Les Pipérales des Antilles Françaises" to the Sept.-Dec. number of the *Bulletin Agricole* of the Agricultural Service of Martinique.

Picnic Grounds. The New York State College of Forestry has issued a 69-page quarto booklet on the design and development of picnic grounds.

Redwoods. Five pamphlets on the redwood forests of California have been issued by the Save-the-Redwoods League, headquarters for which are at the University of California in Berkeley. Titles of these leaflets, four of which are obtainable at 10 cents each, are: "Trees, Shrubs, and Flowers of the Redwood Region" by Willis L. Jepson; "The Story Told by a Fallen Redwood" by Emanuel Fritz; "A Living Link in History" by John C. Merriam; "Redwoods of the Past" by Ralph W. Chaney; and "Saving the Redwoods," a free pamphlet.

Wild Flowers. A recent contribution to the literature on protecting our native plants appears in a leaflet of that title, issued as Circular 230 of the University of New Hampshire's Extension Service.

Touch Not! Leaves of lady-slippers and of the common parsnip, when wet, are likely to cause an eruption on the skin of a person who touches them, W. C. Muenscher points out in a small leaflet on poisonous plants recently published by Cornell.

Notes, News, and Comment

Lectures. Among members of the staff who have appeared on the lecture platform recently are Dr. William J. Robbins, before the American Association for Scientific Workers April 4 at Columbia University; Dr. B. O. Dodge, who spoke at the Medical Center of New York April 8 on how fungus diseases affect plants as contrasted with animals; Miss Elizabeth C. Hall, who gave one of a series of five weekly lectures to a class in landscape architecture at Columbia University at Nevis, Irvington, N. Y., April 7; Dr. H. N. Moldenke, who lectured on "Plants of the Bible" in Maplewood, N. J. April 2; Dr. H. W. Rickett who spoke on "Families of Garden Plants" before the Garden Club of Mt. Vernon April 21; and Mr. G. L. Wittrock, who lectured on "Plants Used by

the American Indians" to two groups of 40 graduate nurses each at Morrisania Hospital April 14 and 15.

Luncheon. Mrs. Elon Huntington Hooker was honored for her seven years of service as President of the Advisory Council at a buffet luncheon given in the Members' Room by the Advisory Council on April 21. In the afternoon a tour of the grounds was made at which the new propagating houses, the Snuff Mill, the Rock Garden, and the Perennial Border were visited by way of the Snake Road and also the new road which is now nearing completion in the northern portion of the grounds. The group was accompanied by Dr. William J. Robbins and Dr. H. A. Gleason, also Messrs. Montagne, Corbett and Pfander, who acted as guides.

Meeting. The American Rock Garden Society met at the New York Botanical Garden April 23 and visited the Thompson Memorial Rock Garden and the collections of naturalized narcissi and magnolias under the direction of Mr. A. C. Pfander. Dr. William J. Robbins addressed the group.

N.A.G. The Greater New York City branch of the National Association of Gardeners met at the Botanical Garden the evening of April 9. Addresses were made by Dr. W. J. Robbins, and Messrs. J. W. Tansey, P. J. McKenna, and T. H. Everett.

Conference. Dr. Stanley A. Cain spoke on "The Significance of Polyploidy in Plant Geography" at the monthly conference of the scientific staff and registered students of the Garden April 11.

Visitors. Scientists from other institutions who have worked at the Garden during the past few weeks include Richard A. Howard of Harvard University, studying a collection of Cuban plants; Hugh Hotson of Cornell, the fungus *Papulaspora* on gladioli; Frank E. Egler of Syracuse, plants of Florida; A. J. Grout, algae; David Sumstine, Carnegie Museum, Pittsburgh, higher fungi; George T. Johnson, Missouri Botanical Garden, and B. H. Davis, New Jersey Experiment Station, cryptogams; and Sisters M. Angela and Mary Delphine, St. Francis Convent, Ringwood, N. J., genetics of the strawberry. Among other visitors in recent weeks have been Brother Celestine of Manhattan College; Senator Thomas C. Desmond of Newburgh; James E. Guncket of Harvard University; Aura de Jacinto of Panama City; Lillian Camire of Trinity College, Burlington, Vt.; Miriam L. Bomhard of the U. S. Forest Service; Arthur Bevan, Tropical Forest Experiment Station, Rio Piedras, Puerto Rico; Dr. and Mrs. E. Dussert of the University of Chile at Santiago; Dr. and Mrs. Hugh Garol, New Haven, Conn., and Ewert Åberg of the Agricultural College at Uppsala, Sweden.

Groups. Garden clubs, Girl Scouts, and other groups that have made special trips to the New York Botanical Garden in recent weeks include 25 members of the Garden Department of the Bronxville Women's Club, who visited the Rock Garden and the Main Conservatories, heard a brief address by Mr. T. H. Everett, then served tea in the Members' Room. Girl Scouts from Englewood, N. J., studied trees at the Garden and Troop *32* of Manhattan studied native plants. Both groups toured the Main Conservatories. Troop 150 from the Bronx also came to the Garden. Fifty kindergarten and first grade children and their mothers visited the Main Conservatories April 15. On two days in March students from New York School of Fine and Applied Art did sketching in Range 1, and on March 29 members of the New York Hiking Club visited there.

Teaching. Dr. Ellys T. Butler, who has been teaching during the past year at Hunter College and at Scoville School in New York, will go to Wheaton College, Norton, Mass., in September for a teaching position in the Botany Department.

Columbia. The Department of Botany and the Libraries of Columbia University presented Dr. Stanley A. Cain in a lecture on "Prehistoric Changes in the Pattern of Western Vegetation," the evening of April 4 in the Low Memorial Library. At the same time there was an exhibit of the Walcott prints of North American wild flowers.

Committee. Dr. A. B. Stout attended the annual meeting of the Lily Committee of the American Horticultural Society in New York March 18.

THE NEW YORK BOTANICAL GARDEN

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 figures, covering algae, fungi, mosses, ferns, flowering plants. 1918. $3.50

A Text-Book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Hardy Ferns and Their Culture. Edited by Carol H. Woodward. 40 pages, illustrated; bound in paper. 25 cents.

Plants of the Holy Scriptures by Eleanor King, illustrated, and accompanied by a list of Plants of the Bible with quotations, in the March 1941 Journal. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward, illustrated, in the May 1941 Journal. 15 cents

Periodicals

Addisonia, annually, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Now in its twenty-first volume. Subscription price, $10 a volume (four years). Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1 a year. single copies 10 cents. Free to members of the Garden. Now in its 42nd volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $7 a year; single copies $1.25 each. Now in its thirty-third volume. Twenty-four Year Index volume $3.

Brittonia. A series of botanical papers. Subscription price, $5 a volume. Now in its fourth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes, each to consist of four or more parts; 90 parts now issued. Not offered in exchange. Prices of the separate parts on request.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each, $5 a volume. In the 14th volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Prices to members of the Garden: Vols. 1-6, $1.50 each; to others, $3. Vol. 7, $2.50 to members; to others, $5. *Contents:* Vol. 1, PER AXEL RYDBERG, An Annotated Catalogue of the Flora of Montana and the Yellowstone Park. Vol. 2, D. T. MACDOUGAL, The Influence of Light and Darkness upon Growth and Development. Vol. 3, ARTHUR HOLLICK and E. C. JEFFREY, Studies of Cretaceous Coniferous Remains from Kreischerville, N. Y. Vol. 4, C. STUART GAGER, Effects of the Rays of Radium on Plants. Vol. 5, NORMAN TAYLOR, Flora of the Vicinity of New York. Vol. 6, Twentieth Anniversary of The New York Botanical Garden. Vol. 7, N. L GARDNER, New Myxophyceae from Porto Rico; A. B. STOUT, The Flower Behavior of Avocados; H H. RUSBY, Plants Collected in the Amazon Valley; ARTHUR HOLLICK, The Flora of the Saint Eugene Silts.

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CAROL H. WOODWARD, Editor

June 1941

ENTRANCE TO THE ROSE GARDEN — Cover Photograph by Fleda Griffith
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THE ROSE GARDEN

A new one-way road for motorists starting near the rear of the Museum Building, going over the Boulder Bridge (which has been extended 125 feet), up the hill, through the woods, and past part of the plantings of deciduous trees, leads directly to the Rose Garden. This June, for the first time since the fence was erected around the grounds, the Rose Garden is accessible by automobile within the Botanical Garden's boundaries.

For pedestrians there is a well marked path which starts at the triangle east of the Main Conservatories, where the Snake Road also begins to wind through the woods.

Appropriately, the Rose Garden never has been finer than this year, and record crowds of visitors have enjoyed it. While the majority have come solely for the pleasure of enjoying the sight and the fragrance of these thousands of roses all in bloom at one time, the completeness of the collection, its arrangement in systematic groups and the labeling of each variety make this garden an important field of study for horticulturists.

This fact, as well as the beauty of the place and the good culture that is evidenced in the health and vigor of the plants, is recognized by the man who, more than any other, is responsible for the fine display that the Garden is able to offer each year. Mr L C. Bobbink, in writing to the Garden recently, said:

"Yesterday I visited the Rose Garden, and I must say that it looks even better than last year, when it was very fine. The growth, foliage, and general appearance of the plants is far superior to roses in any other garden I know of." While other gardens are larger, he continued, and more spectacular, this one, largely because of the interesting collection of varieties, is of particular value for study.

Through this extensive planting, which comprises some 6,000 plants of more than 600 varieties and many natural species, the Botanical Garden carries out part of its horticultural function that of growing and displaying as many varieties as practicable in an arrangement useful to the student and the amateur but at the same time attractive to the general public interested primarily in the loveliness of flowers.

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Fruits For The Home Garden

By Edwin Beckett

THE object of this short article is to attempt to determine by means of review which are the kinds of fruits best suited to grow in the home garden. The term "home garden" in this instance is to be interpreted as the garden of modest size, tended by the owner or his family with occasional help, and able to accommodate some fruit-bearing plants, either large or small as the situation justifies. It should be noted, however, that this is not an attempt to describe in detail the various methods of culture of these fruits, with the many theories of pruning, schedules of spraying, selection of varieties as to locality and the necessary detail imperative in the production of first-class fruit to compete in the market, but rather to discuss in a general way those best suited for the purpose in mind. Choice of kinds must of necessity rest with the owner, as limitations of area, locality, and personal likes and dislikes for certain fruits govern this.

The Tree Fruits

As a group, the tree fruits—apples, cherries, pears, peaches, plums, etc.—are likely to be less attractive to the small property owner, because they need comparatively large areas to develop and they also present a considerable problem in the matter of control of insect and fungus pests, much more so than do the small fruits. This, however, need not deter the owner from growing these, especially as some of them may, if the site is favorable, be included among ornamental subjects and thus serve a dual purpose. Not infrequently such trees, apples particularly, are planted on lawns, their conformation when having attained considerable age making them most adaptable as landscape features. From the standpoint of fruit growing, however, it is considered that the planting of young stock is the right way to commence operations and to plant where cultivation of the ground can be carried out at will.

Assuming that apples are to be considered in the list of fruits and that young trees are to be planted, the grower must not lose sight of the fact that a number of years must elapse before a crop of any size will be borne by orchard type trees. Generally the earlier varieties commence bearing somewhat sooner than the late varieties, but unless early apples are desired for some particular purpose they are of less importance and should be planted very sparingly. They require using almost as soon as picked, keeping only a few days, and at best are of second-rate quality only. My choice of varieties to cover the whole season, should room permit, would be: ***Yellow Transparent, Duchess of Oldenburg, Gravenstein, McIntosh, Delicious, Northern Spy, Baldwin.*** Three only would be: ***Duchess of Oldenburg, McIntosh, Baldwin.*** One only: ***Baldwin.*** As mentioned before, choice depends on personal taste. It should be noted that some apples are more or less self-sterile and in order to produce a full crop need pollen from other varieties to effect fertilization. McIntosh is a notable example and should not be planted solely. This characteristic is also found in other fruits, especially plums and apricots.

Pears, while not requiring so much space as apples, are not as popular generally, as the fruit is not usable in such a diverse number of ways, consequently it is in less demand. Again too, fire-blight, in some localities so prevalent a disease as to make pear growing almost impossible, is a controlling factor. ***Clapp's Favorite*** is a good quality, early ripening pear. ***Bartlett*** is excellent and both require picking ahead of ripening, and finishing in a cool dark place. Among the late pears many of the listed varieties are of moderate quality. ***Beurré Bosc*** is a good midseason variety and ***Winter Nelis, Glou Morceau*** and ***Doyenné du Comice*** are first-rate winter pears. ***Doyenné du Comice*** is so outstanding in quality as to merit special mention. It is grown largely in California and quantities of it are sold in the eastern markets. I know it will grow in the East, however, as I have grown it. The reason for its absence from trade lists I do not understand, but if it is possible to obtain stock of it no one should hesitate to try it. It would be my "one only" choice in the pears.

Before leaving the apple and pear question, serious consideration should be given to the type of trees to be planted, particularly if limited room is available, those on dwarfing stocks being admirably suited for the home garden under such conditions. Not only do these trees require much less space in which to grow but they also produce fruit while comparatively young and continue to increase in productivity as they increase in size, whereas the orchard type requires a number of years before bearing commences. These dwarf trees may be obtained in the bush form, as also in the espalier trained. There is nothing mysterious or difficult in the pruning required to maintain their particular type. I think a great deal of the difficulty experienced by many who have planted them has been due to the unsuitability of the understock used in their working. Con-

Photograph by Edwin Beckett

An old apple tree from an orchard forms part of the landscape in this springtime scene.

siderable experimentation has been carried on by the various State Agricultural Experiment Stations to produce suitable stocks for this work, and a good deal of information and help can be obtained from them in this direction, with no doubt the names of firms that are producing trees on stocks that are definitely dwarfing in character.

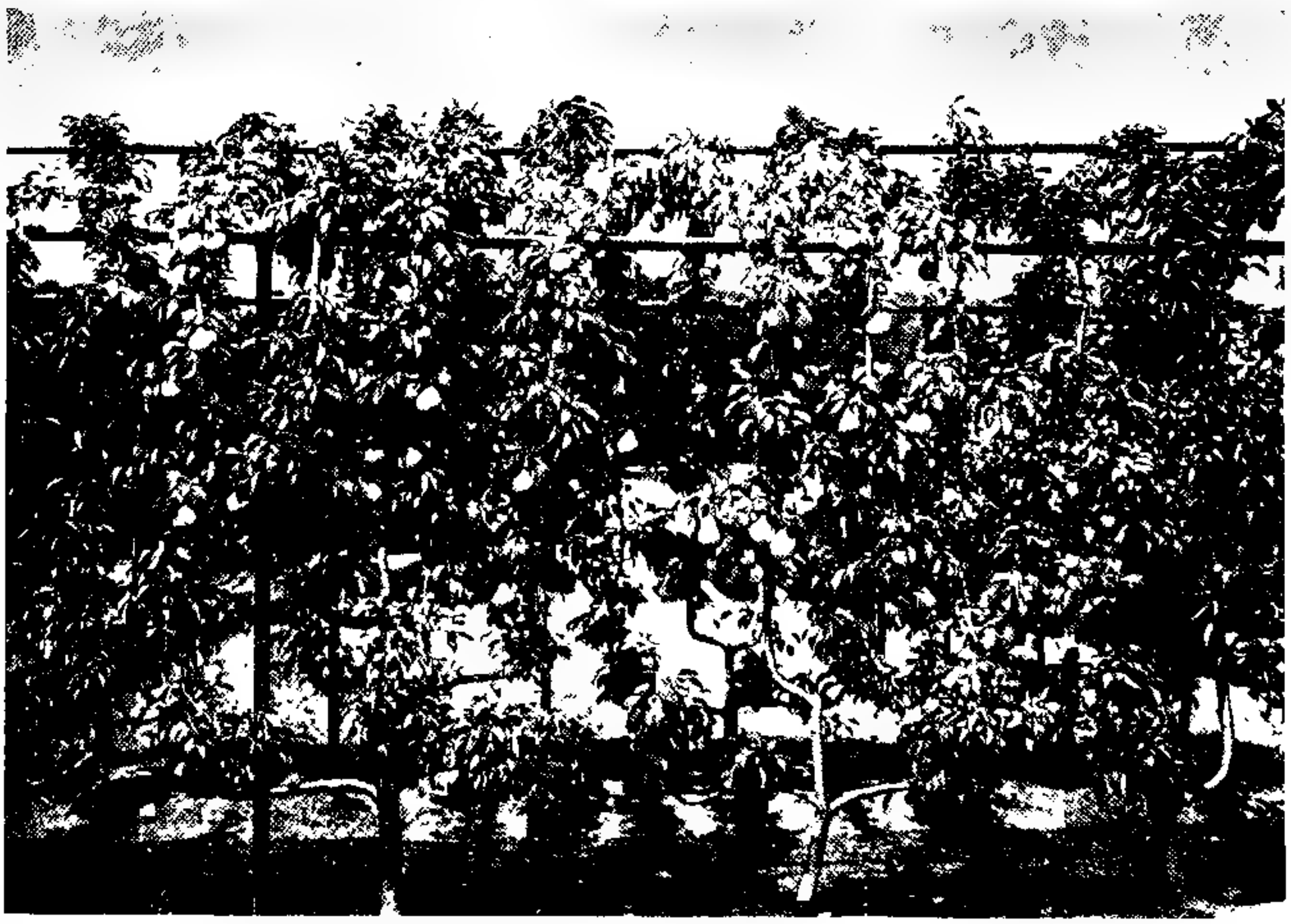
Peaches, without doubt, are well worth the effort needed to produce good fruit from the home garden. The difference between fruit picked firm enough to be marketed, perhaps a week before being fit to eat, and that ripened on the tree is considerable and needs to be experienced to be appreciated. Peaches come into bearing relatively young but their fruiting life is short, compared with that of apples and pears. Their uses are many and in my estimation they are definitely on the "yes" list. Good varieties for home growing are: ***Carmen, Early Crawford, Rochester, Belle of Georgia,*** and ***Elberta.***

There are numerous types of plums which in a limited way should be used. Varieties are many. Some of the Japanese are heavy croppers and

generally earlier to ripen than those of European origin. They are excellent for preserving and definitely worth while. For quality fruit ***Coe's Golden Drop*** and the ***Green Gage*** plums, such as ***Imperial Gage*** and ***Reine Claude de Bavay*** should be planted. These ripen later in the season. The prune plums are also good.

A word about that plus number one pest, the Japanese beetle. My observation has been that plums, along with sassafras and lindens, are their first dietary choice, consequently the early-ripening plums which mature at a time when these delightful visitors are at their height are fully enjoyed by the beetles. As this stone fruit is susceptible to burning from the too free use of arsenical sprays, which seem as yet to be the most efficient preventive for repelling the beetle, it would appear logical that within an area infested with beetles, late-ripening plums, coming at a time when the beetle is on the wane, would be the ones to plant. Small trees may of course be screened with muslin, but this procedure is not altogether a successful or picturesque method of obtaining plums.

Apricots in the East are not too reliable a crop. The trees are particularly beautiful in bloom, however, and might well be considered from an ornamental standpoint. Early flowering, the blooms are apt to be injured by



Photograph by Edwin Beckett

Pears grown in espalier fashion, either against a wall or as a pergola, give an abundance of fruit in little space.

late frosts, and if fruit appears it is attractive to the curculio, which is one of the pests most likely to be of serious concern. ***Moorpark*** is an excellent variety and delicious when ripened on the tree.

One of the fruits that can be planted to advantage with the view in mind of utility and landscape effect is the sweet cherry, not forgetting of course its ultimate size. There are several excellent varieties both in the light and dark sorts. The sour cherries also have favorable qualities and are more likely to succeed under adverse conditions than the sweet. ***Montmorency*** fruits quite heavily while comparatively young and is reliable. ***Morello*** is darker in color than the preceding, having too a dark colored juice, is equally sour, but excellent for pies, canning, and the making of brandied cherries. It is possible, I believe, to obtain this variety espalier trained and in this form it is particularly suited as a subject for a north wall, a position not easily utilized by other fruit trees.

Grapes In The Garden

Grapes are first-rate for the home garden and one of the most accommodating of subjects. They may be planted in various ways, in a block, or what is perhaps more adaptable to the small planting, grown on a fence, employed as a dividing line between plots or used in an ornamental way, as covering for an arbor or pergola. Whatever the style, for a minimum amount of trouble a reliable return may be expected. While it is necessary, to ensure a crop of bunches of good size, to resort to one of the accepted styles of pruning or an adaptation of it, sensible thinning and restriction of the growths when planted as an ornamental feature will usually supply family needs. ***Caco, Moore's Early, Concord*** and ***Niagara*** are good varieties in the various colors. The members of the *Vitis* group are very attractive to the Japanese beetle, particularly the young shoots. The berries though seem to possess less attraction and as a rule little damage is done to the fruits themselves.

Berries and Other Small Fruits

Possibly the most interesting and attractive kinds of fruit from the home grower's standpoint are the berries and similar fruits which grow on small herbaceous plants or shrubs. As a class more is to be gained by their culture than from the fruits above discussed, partly because they are more perishable and home grown fruits can be put on the table in a more attractive condition than those that are purchased at a market. Also they commence to bear and carry full crops within a year or two of planting, whereas the tree-grown fruits, with one or two exceptions, require many years to attain fruiting size.

Strawberries ask for no intricate cultural skill and never wane in popularity. I prefer spring planting to late summer, and for home use the plants should be maintained as separate identities, the runners always

being removed except when needed for replanting to produce new beds, which should be done every alternate spring. By following this method a larger proportion of top-size berries will be produced. Whatever varieties are favored, the gardener will want to include ***Dorsett, Fairfax*** and ***Premier*** for summer fruiting. The so-called everbearing type is well worth growing as a late fruiting kind. ***Mastodon*** is good.

Raspberries by all means. ***Latham*** is an excellent main crop variety and the late fruiting propensities of the everbearing kinds warrant their inclusion in the list. ***St. Regis*** and ***La France*** follow one another in their schedule of ripening, both the first and last crop, and extend the season over a considerable period.

Photograph by J. Horace McFarland Co.

First choice among the small fruits—a high-bush blueberry, which is as ornamental in flower as it is delicious in fruit.

The blackcap raspberries, while not grown as extensively as the red varieties, seem to me to be deserving of more recognition. ***Cumberland*** is a standard of this most delicious berry.

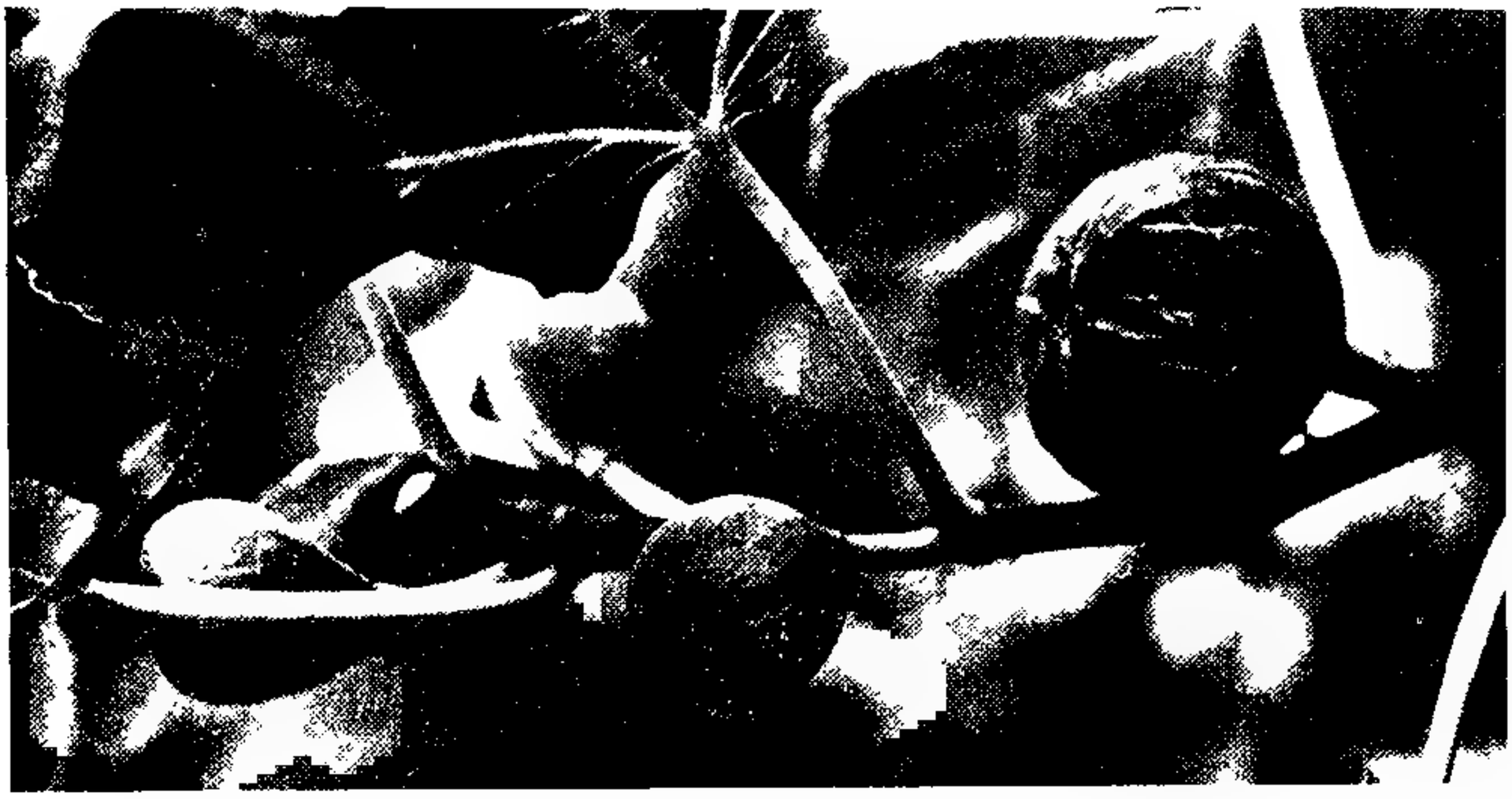
If personal preference decided the order of rotation, the first on this list of small fruits would have been the blueberry. This exquisite fruit, in my opinion, should be in every home garden. Of course, the ideal way to grow it, to obtain the best out of the bushes, is as a cultivated crop, but as an ornamental shrub, though seldom exploited as such, the blueberry is one of the handsomest. By judicious selection of varieties, which is now possible, its season extends over a long period, and once the plants are established the subsequent care is practically nil, making it one of the least troublesome of all fruits to handle. Its main demand is an acid soil, well supplied with humus. Since the introduction of hybrids and selected wild forms, coupled with the scientific vegetative production methods that have made the plants available in quantities, the blueberry has jumped into popularity, and rightly so, as the improvement over the typical wildings is remarkable. The prices asked for young plants of the improved types are perhaps a deterrent to some people planting them but they are well worth the investment.

Were I planting my own garden, blackberries would be one of the last representatives considered, and if I could keep them outside the fence that is where they would be. Nevertheless, I know many people have a liking for them; they add variety, and mention of them should not be omitted.

The currants likewise have a more or less uncertain following and are usually not in great demand. The reds are an excellent source of jelly, however, and are sometimes called on to augment the raspberries when short, these two fruits melding exceptionally well in pies or preserves. The black currants, on the black list pathologically in some sections, also have their adherents, making an excellent jelly.

Figs Fresh From the Tree

A fruit of first-rate quality, very much appreciated by some people, but one of those for which it is necessary with some to cultivate a taste, is the fig. The fruits are usually termed "green" figs to differentiate between the fresh ones and the well known dried figs, which are the same fruits processed for marketing. In the vicinity of New York the tree is not completely hardy, needing protection in winter, and this no doubt is against its more universal cultivation in this section. It is one of those fruits that must be eaten ripe from the tree, if one is to enjoy it at its best. There is no comparison between figs so obtained and those which find their way into the markets as "green" figs. The usual methods of handling are either, to grow as a tubbed shrub, plunging or planting out during the summer and removing to a cool cellar or place where protection



Photograph by Edwin Beckett

Fruiting branch of a Brown Turkey fig The fruit at the right is in prime condition for eating. It would be impossible to pack fruit for the market in this condition as the skin is breakable at the slightest touch

from hard freezing can be given during the winter, or to plant permanently and box or cover the tree where it stands. If the latter method is adopted it is advisable to cut back some of the main growths periodically to induce basal growths. By so doing a more shrubby character is maintained with wood that is more supple than if left to grow unchecked. This makes for ease in covering as these growths can be brought to the ground, boxed and covered with sand or soil. Figs are easily handled, are seldom attacked by insects or disease, need a minimum of care, are reliable croppers coming into bearing when two or three years old. Moreover, they are easily propagated from cuttings. ***Brown Turkey*** is the outstanding variety and best suited for growing in the East.

Advice to the Fruit Grower

It is well, before attempting to plant fruits of the various kinds, to exercise care in the selection of stocks in order that plants true to name, free from disease, and of good types be obtained. So much time must necessarily elapse before errors are detected in many cases that this detail is important. Sources of supply of the utmost reliability only should be considered. Also, of equal importance, is the advice which is always freely given by State and County Agricultural agencies. It should be sought before commencing operations. These bodies are equipped through years of experimentation and research to give valuable information as to varieties best suited, soil conditions, and atmospheric peculiarities pertaining to certain areas. Much valuable time and effort may be saved, to say nothing of expense, by consultation.

Check-List Of Plants In The Unicorn Tapestries

By E. J. Alexander and Carol H. Woodward

TO CONCLUDE the present study of the flora of the Unicorn Tapestries presented in the May number of this Journal, a check-list of the plants is given here with one or more drawings of each subject shown in its relative position in the design. The numbers are for reference to the list.

The drawings were made by Walter Graham, through the co-operation of the Work Projects Administration, from photographs supplied by the Metropolitan Museum of Art.

Changes in the identification of a few of the subjects since the original article was written, and discovery of several duplications in the original numbering have altered the total figure to 101 different kinds of plants (including fruits of two of the flowers), of which 16 still remain complete mysteries. Of the remaining 85, the majority are unquestionable in their identity. Even though one plant, for example, which occurs several times in the second tapestry, is shown with only four petals instead of five, there can be little doubt from a study of its form that it was intended for the pimpernel. In practically every other instance, such details as the number of petals are woven into the pattern with great accuracy. Wherever there is still doubt about the identity of a plant, a question-mark is used.

TAPESTRY No 5

(*The sixth in the order of hanging.*)

The right-hand fragment of these two contains the only apple tree shown in the entire series. It apparently formed the central feature of the original fifth tapestry, in which the Unicorn has become captured by the Virgin. A huntsman and one of the Virgin's handmaidens are shown here, one without, the other within, the rose-entwined enclosure.

As can be seen from the preceding article, color has been a determining factor in several instances, yet it has usually been backed by a distinguishing form of leaf or general growth habit. The reader who visits The Cloisters in Fort Tryon Park, New York City, and uses this list with the drawings as a guide can readily see why, for example, No. 64 was called the ox-eye daisy and No. 62 the corn-marigold; No. 22 the wall-flower and No. 26 the dame's violet.

Even a study of these drawings will reveal to some degree the difference in style of the first and seventh from the other five tapestries.

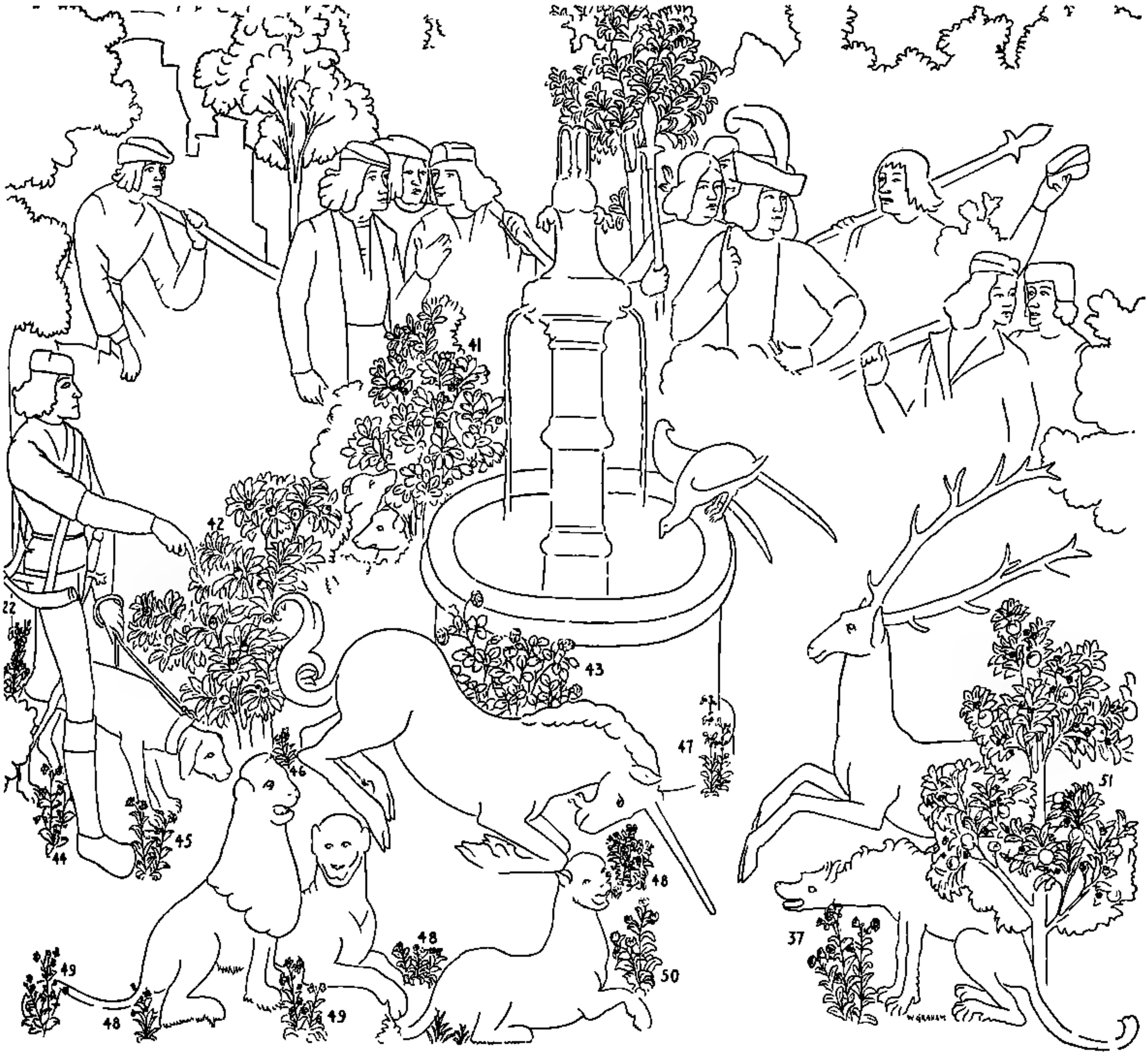
So far as possible in the next six pages the list of plants accompanies the tapestry in which they occur.

TAPESTRY No. 1

The Start of the Hunt

Tapestry No. 1

1. *Scilla nonscripta* (ENGLISH BLUEBELL)
2. ?
3. ?
4. *Lunaria biennis* or *L. rediviva* (HONESTY)
5. *Hieracium* or *Crepis* (HAWKWEED)
6. *Narcissus* (fruit) (DAFFODIL)
7. *Prunus avium* or *P. Cerasus* (CHERRY)
8. *Fragaria vesca* (STRAWBERRY)
9. *Ulmus procera* (ELM)
10. *Tilia europaea* (LINDEN)
11. *Prunus domestica* (?) (BLUE PLUM)
12. *Populus tremula* (ASPEN)
13. *Juglans regia* (WALNUT)
14. *Narcissus Pseudo-narcissus* (DAFFODIL)
15. *Sagittaria sagittifolia* (ARROWHEAD)
16. *Mentha arvensis* (MINT)
17. *Carex muricata* (SEDGE)
18. *Cirsium* or *Carduus* (WHITE THISTLE)
19. *Dianthus Seguieri* (BROAD-LEAVED PINK)
20. *Hyacinthus* or *Scilla* (HYACINTH or SQUILL)



TAPESTRY No. 2

The Unicorn at the Fountain

21. *Inula salicina* (A relative of ELECAMPANE)
22. *Cheiranthus Cheiri* (WALLFLOWER)
23. *Alchemilla vulgaris* (LADY'S MANTLE)
24. ?
25. *Viola odorata* (SWEET VIOLET)
26. *Hesperis matronalis* (DAME'S ROCKET or DAME'S VIOLET)
27. ?
28. *Vinca major* or *V. minor* (PERIWINKLE)
29. ?
30. *Trifolium hybridum* (ALSATIAN CLOVER; ALSIKE)
31. ?
32. *Centaurea Cyanus* (CORNFLOWER; BACHELOR'S BUTTON)
33. *Rumex Acetosa* (GARDEN SORREL)
34. *Phoenix dactylifera* (DATE PALM)
35. *Ruscus aculeatus* (BUTCHER'S BROOM)
36. *Bellis perennis* (ENGLISH DAISY)
37. *Calendula officinalis* (POT-MARIGOLD)
38. *Dianthus superbus* (FRINGED PINK)
39. ?

Tapestry No. 2

40. *Fagus sylvatica* (BEECH)
41. *Prunus domestica* (BLUE PLUM)
42. *Mespilus germanica* (MEDLAR)
43. *Rosa centifolia* (CABBAGE ROSE)
44. *Viola tricolor* (PANSY)
45. *Lychnis alba* (WHITE CAMPION)
46. ?
47. *Salvia officinalis* (SAGE)
48. *Anagallis arvensis* (PIMPERNEL)
49. ?
50. *Physalis Alkekengi* (GROUND-CHERRY; JAPANESE LANTERN-PLANT)
51. *Citrus sinensis* (ORANGE)

TAPESTRY No. 3

The Unicorn Attacked

Tapestry No. 3

52. *Prunus domestica* var. *Institia* (DAMSON; BULLACE PLUM)
53. *Ilex Aquifolium* (HOLLY)
54. *Corylus Avellana* (HAZELNUT; FILBERT)
55. *Phyteuma* (RAMPION)
56. *Adonis aestivalis* (PHEASANT'S-EYE)
57. ?
58. ?
59. *Crataegus Oxyacantha* (HAWTHORN)
60. *Punica Granatum* (POMEGRANATE)
61. *Senecio paludosus* (GROUNDSEL; RAGWORT)
62. *Chrysanthemum segetum* (CORN-MARIGOLD)
63. *Salvia Sclarea* (CLARY)
64. *Chrysanthemum Leucanthemum* (OX-EYE DAISY; COMMON FIELD DAISY)
65. *Primula* (PRIMROSE)
66. *Iris Pseudacorus* (YELLOW FLAG)

TAPESTRY No. 4

The Unicorn Defending Himself

67. *Plantago Cornuti* (PLANTAIN)
68. *Nigella arvensis* (Relative of LOVE-IN-A-MIST)

Tapestry No. 4

69. *Arbutus Unedo* (STRAWBERRY-TREE)
70. *Prunus Armeniaca* (APRICOT)
71. *Quercus Robur* (ENGLISH OAK)
72. ?
73. ?
74. *Chrysanthemum Parthenium* (FEVER-FEW)
75. *Stratiotes aloides* (WATER-SOLDIER)
76. *Typha latifolia* (CAT-TAIL)
77. *Myosotis scorpioides* (FORGET-ME-NOT)
78. ?
79. *Cirsium arvense* ("CANADA" THISTLE)
80. *Prunus Persica* (PEACH)

TAPESTRY No. 6

(The fifth in the order of hanging)

The Unicorn Killed and Brought to the Castle

Tapestry No. 6

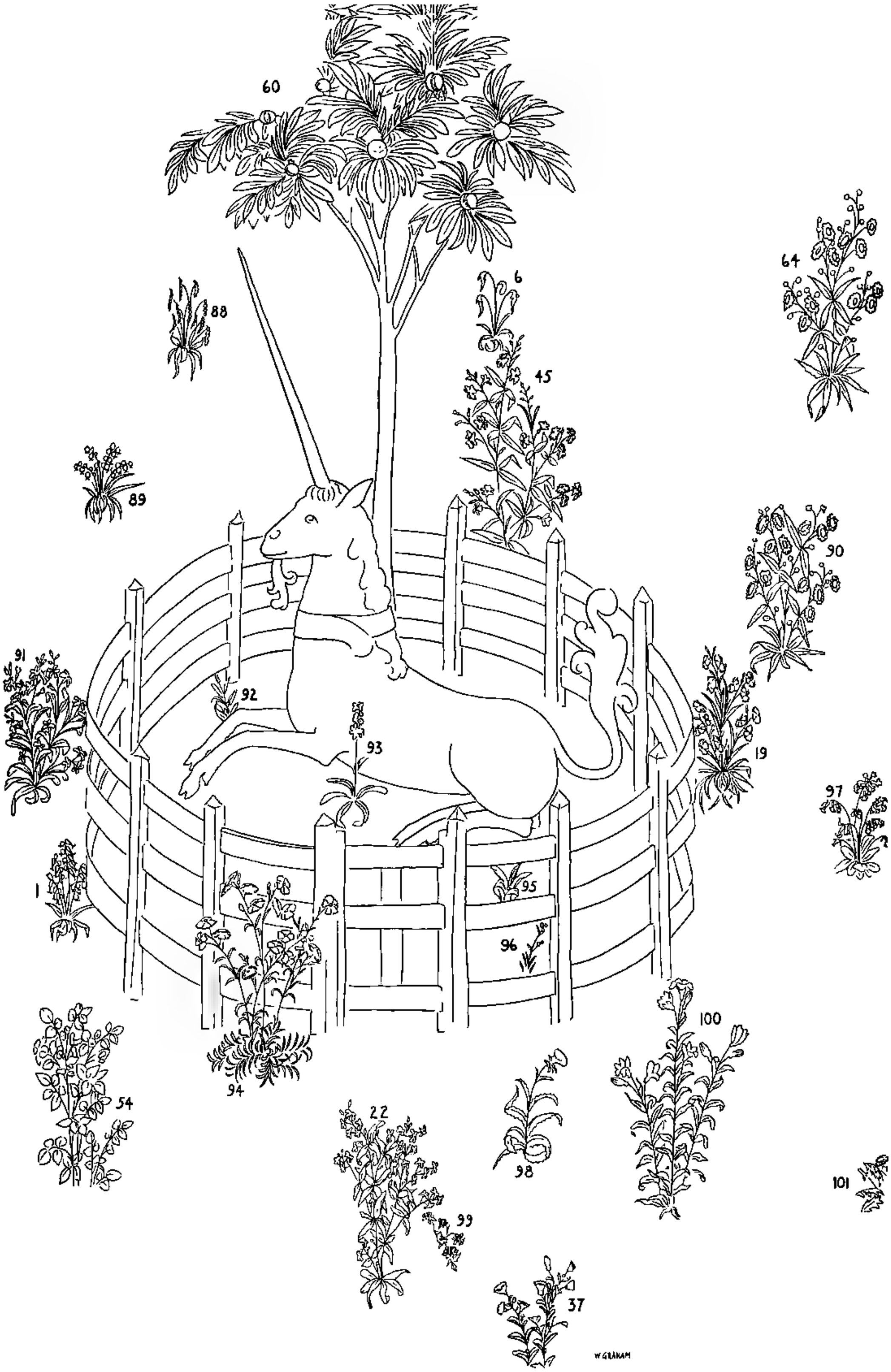
81. ?
82. *Rubus fruticosus* (BLACKBERRY)
83. *Iris germanica* (BEARDED IRIS)
84. *Cucubalus baccifer*
85. *Phyllitis Scolopendrium* (HART'S-TONGUE FERN)
86. *Carthamus tinctorius* (SAFFLOWER)

Tapestry No. 5

87. *Malus pumila* (APPLE)

Tapestry No. 7

88. ?
89. *Scilla nonscripta* (fruit) (ENGLISH BLUEBELL)
90. *Senecio Doronicum* (LEOPARD'S-BANE)
91. *Mathiola incana* (STOCK)
92. *Polygonum Bistorta* (BISTORT)
93. *Orchis mascula* (MALE ORCHIS)
94. *Dianthus Caryophyllus* (CARNATION)
95. *Arum maculatum* (CUCKOO-PINT; LORDS AND LADIES)
96. ?
97. *Primula elatior* (OXLIP)
98. *Silybum Marianum* (HOLY, MILK, or ST. MARY'S THISTLE)
99. *Aquilegia vulgaris* (COLUMBINE)
100. *Lilium candidum* (MADONNA LILY)
101. *Taraxacum officinale* (DANDELION)



TAPESTRY No. 7

The Unicorn in Captivity

147

*Important Publications From The Garden Herbarium**

By H. A. Gleason

THE value of an herbarium lies solely in the use which is made of it. No matter how large it may be, or how well prepared and stored, or how wide its scope, or how accurately the plants are named, an herbarium is otherwise merely a collection. Its use, moreover, must not be restricted to increasing your knowledge or mine as individuals. The information which may be gathered from it must be diffused and made available to all. These facts have been so well understood for so many years that the importance of an herbarium may be judged by its contribution to the general knowledge of plants.

Dr. Barnhart has told you how this herbarium is actually older than the building which it occupies, older than any developments on these grounds. I propose to tell you its active use began with its very inception and has continued without interruption to the present time, and to show you some of the important contributions to knowledge which have emanated from it.

While our herbarium was still occupying temporary quarters in the rooms of Columbia College, Dr. Britton began to use it. With the collaboration of Judge Addison Brown there was produced the famous Illustrated Flora of the Northeastern States and Canada, the first fully illustrated flora for any part of our country. Of this book and its second edition thousands of copies were sold. It may be truly said that no other book has been so thoroughly useful in enabling amateurs, students, teachers, and professional botanists to learn the names of the plants about them. Through this book the knowledge of plants, derived from the herbarium by the master mind of Dr. Britton, has been made available to all interested persons. That is the real function of the herbarium.

Among the first appointments to the scientific staff of the New York Botanical Garden were botanists qualified to use the herbarium for further research. They and their colleagues and successors have continued the tradition set by Dr. Britton, and from this herbarium has appeared a long series of scientific publications. In total number they exceed a thousand; in total pages they probably surpass twenty thousand. While mere bulk may be impressive, these publications have also been of high quality. They enjoy the respect of the botanical public. They are used far and wide as standard sources of authoritative information about plants. It is obviously impossible to discuss more than a few of them, selecting those that are noteworthy both for their size and content, and omitting the vast majority which are smaller in size because of more restricted scope.

Let me mention first the floras of various regions. All these are alike in giving the names of all plants growing naturally in the region covered by the book, with a description of each, and in giving keys by which you or I may find the name of any plant which interests us. Every one of them has facilitated botanical study; every one has stimulated further botanical work and has led to still greater knowledge of the plant life.

Beginning with the West Indies, we have Britton's Flora of Bermuda, describing about 500 species in this little island group, published in 1918, the first and still the only flora of the region. Next is the Bahama Flora, by Britton and Millspaugh, published in 1920 and describing nearly 2,000 plants of these islands, again the first and only published flora. Third, the Flora of Puerto Rico, including more than 2,000 kinds of flowering plants, nearly 300 ferns, and still to be supplemented by further parts dealing with the lower orders of plants. Fourth, the flora of Cuba, unfortunately not published because of lack of funds, com-

* This was one of the papers given at the program Dec. 11, 1940, in observance of the incorporation of the two millionth specimen in the herbarium. The other addresses have been published in the Journal for January, February, March, and April, 1941.

piled by Britton and Wilson, including about 7,000 kinds of plants, and essentially ready for the press at the time of Dr. Britton's passing.

The southeastern states had a flora written by Chapman and published about eighty years ago. This book, becoming woefully out of date, was replaced in 1903 by Small's great Flora of the Southeastern States, for many years the standard reference book for all students of our diversified southern flora. Because of the great number of plants included, the area was later reduced to the states east of the Mississippi River. His newer book, the Manual of the Southeastern Flora, covers this area and appeared in 1933.

At the time of Dr. Small's death he had in preparation another flora for the south-central states of Arkansas, Oklahoma, Louisiana and Texas. Efforts are being made to complete and publish it.

Rydberg's Flora of the Prairies and Plains was published in 1932, a year after the author's death. It covers the states of Minnesota, Iowa, Missouri, the Dakotas, Nebraska and Kansas. Rydberg also published a Flora of the Rocky Mountains in 1917, covering the mountain states from Colorado northward. This is also a book of the highest value to botanical students, but is unfortunately now out of print.

These floras of Small and Rydberg, together with the Illustrated Flora of Britton and Brown, cover more than three-quarters of the United States.

Among books dealing with a more restricted field of botany or with a more limited region, the first to be mentioned are the popular books of W. A. Murrill on mushrooms and their relatives. Although the last of them was published in 1915, they have never lost their popularity or their usefulness as guides to the study of these fungi. Here also is Dr. Seaver's book on the North American cup-fungi, published in 1928. It discusses a large group of fungi of considerable economic importance and is unique in its field. It is everywhere recognized as the standard reference book on the subject.

Besides his extensive floras, Dr. Small also wrote several smaller books, such as his flora of Miami and the handsomely illustrated Ferns of the Southeastern States.

Noteworthy as a botanical monograph is the great work on the Cactaceae by Britton and Rose, published by the Carnegie Institution, but based on preserved material in our herbarium and living plants in our greenhouses. Handsomely illustrated with numerous color-plates and halftone engravings, it is the only complete discussion of this interesting and typically American family of plants. It also is now out of print and the few second-hand copies which occasionally come into the market command high prices.

Our latest contribution, Mackenzie's atlas of the North American sedges, was published last summer. It contains more than 500 plates, illustrating every North American species. Mackenzie's work was largely based on material in our herbarium, and his private herbarium has since been added to ours.

Lastly, and with especial pride, I mention North American Flora, with one exception the most ambitious botanical project ever undertaken. As its name indicates, it is a complete descriptive flora of all the kinds of plants of the entire North American continent, including Central America and the West Indies. It includes all from the smallest and simplest microscopic plants up to the largest and most complex. It was originally planned to be completed in 34 volumes; this plan will be followed, but the size of many volumes will necessitate binding in two or three parts. To date 90 parts have been printed, amounting to about 7,000 pages, and it is still less than half done. It is a work of multiple authorship, since the task is far too great for any one person. To its production the Garden staff has naturally contributed heavily, but specialists in many other institutions are also collaborating, giving their services without cost, since they recognize the extraordinary scientific importance of the work. At the present time no less than 67 botanists are engaged and every one of them is the recognized authority on the group which he is treating. These men live from California to Massachusetts and in half a dozen foreign countries. Our herbarium material is sent to them for study, so that North American Flora is also truly a product of our herbarium.

Buy Your New Books Through The Garden!

Through the Library of the New York Botanical Garden, books reviewed in the Journal, as well as other volumes desired, may be purchased on special order. The arrangements made with the publishers went into effect in early June. A check or money order sent in for the retail price of a book will bring the volume by mail to the purchaser within a few days. (For delivery within New York City, 2% sales tax must be added.) This service to readers will at the same time help to support the work of the New York Botanical Garden.

Dr. A. J. Grout Named Honorary Curator Of Mosses

DR. A. J. GROUT of Newfane, Vt., and Manatee, Fla., has been appointed Honorary Curator of Mosses at the New York Botanical Garden. Since 1930 he has been on the research staff of the Biological Laboratory at Cold Spring Harbor, and is now working with Dr. William C. Steere of Michigan in continuing the treatment of mosses for *North American Flora.*

A life-long friend of Dr. Marshall A. Howe, former Director of the New York Botanical Garden, Dr. Grout was born in the same Vermont village and in the same year as Dr. Howe. For many years he has maintained a close association with the New York Botanical Garden, doing much of the research here for his monumental work, *Moss Flora of North America,* begun in 1928 and completed in three large volumes last year.

While this work is invaluable from the scientific point of view, Dr. Grout's greatest influence has been felt through his popular books: "Mosses with a Hand Lens," which went into three editions 1900, 1905, 1924—and "Mosses with a Hand Lens and Microscope" (1910). It is believed that these publications have done more than any others of the period to stimulate the remarkable revival of interest in mosses which has been so apparent.

For 37 years Dr. Grout was a teacher of biology in normal and high schools, much of the time in New York City. From its beginning in 1898 he edited *The Bryologist,* guiding the magazine for its first eight years. Since 1914 he has served continuously as one of the associate editors. During his 40 years of devotion to the study of mosses, he has published more than 100 articles on the taxonomy and morphology of the group.

Garden's Bananas Are Cut For Bronx Children

BOYS AND GIRLS in the care of the Bronx Society for the Prevention of Cruelty to Children were the recipients of the large bunch of bananas which has been slowly maturing in the Tropical Flower Garden in the Main Conservatories at the New York Botanical Garden. With two gardeners holding a high ladder and two more tugging at the end of a pulley to prevent the bunch from falling when its stalk was severed, Borough President James J. Lyons of the Bronx, decked with a cork helmet and armed with a machete, officially cut the bananas from the Botanical Garden's plant.

Weighing approximately 175 pounds and containing upwards of 250 bananas,

Photograph by Samuel Seigel, through the co-operation of the W.P.A.

Borough President James J. Lyons preparing to cut the "world's largest greenhouse-grown bunch of bananas" at the Botanical Garden.

the bunch was believed to be the largest ever grown in a public conservatory. The plant itself was 26 feet high and had leaves up to 12 feet long and more than 3 feet in width.

The shoot of this banana plant first appeared above the ground a year ago last September, arising from the rootstock of a plant that was then bearing fruit. Fourteen months later, on Nov. 10, 1940, when it had grown to its present height, a flower bud was first observed. Less than two weeks later, on Sunday, Nov. 23, a loud report was heard in the greenhouse about noontime. It was the breaking of the stalk of the largest leaf by the expanding of the flower cluster.

The blooming period was brief. Within a few days small green bananas became visible along the stalk, which by then was hanging in full view of visitors. The stalk continued to grow downward, as the bananas increased in size, and many more flowers appeared toward the tip, but no more fruits were formed.

All winter long and all spring the bananas remained green. The first signs of maturity began to show early in May when a single fruit turned yellow. The entire bunch was to be thoroughly ripened in a cellar before being fed to the children. There is a second banana plant rapidly approaching the height of the first, which was cut down a few hours after the fruits were taken. A still younger plant, now about four months old, is arising from the same rootstalk.

Cloisters Lectures

Between 80 and 150 members of the Metropolitan Museum of Art and the New York Botanical Garden attended the series of five lectures on "Gardens and Plant Lore of Mediaeval Europe" which was announced in the Garden's Journal last January. The lectures took place on five successive Thursday afternoons beginning April 24, the first, second, and fourth at The Cloisters, where the audience visited the mediaeval herb garden in the Bonnefont Cloister after each talk, and the third and fifth at the Botanical Garden, where the Thompson Memorial Rock Garden and other plantings were viewed at the close of each program. Tea was served in the library and tower at The Cloisters by the staff of the institution, and at the Botanical Garden in the Members' Room by the Advisory Council. The series of lectures was built around the study of the flora of the Unicorn Tapestries at the Cloisters, the results of which are being published in the Journal for May and June.

Plant Distribution

More than 300 members of the New York Botanical Garden received 3,621 plants for their gardens and homes in the plant distribution which took place the last of April. These plants, which are little known horticulturally, have been grown by the Botanical Garden and

proved to be worthy subjects for home culture. They have consequently been propagated especially for members.

The plants offered were one specimen of *Tradescantia Warscewicziana,* a promising house-plant which was described in the Journal for December 1939; three specimens of *Helianthus tuberosus flore-pleno,* a double form of the native "Jerusalem" artichoke, somewhat resembling golden-glow but more vivid in color, more sturdy in structure, and standing about 4 feet high; and ten bulbs of *Allium tuberosum* (formerly known as *A. odorum*), a fragrant flowering onion with a stalk 30 inches high blooming in August. The stock of this allium originally came from the garden of the late Louise Beebe Wilder.

Members who had requested plants of *Veronica spicata rosea* last year after the supply was exhausted, received their share of this attractive border perennial this spring.

Besides this individual distribution of plants to members, the Garden has sent many thousands of plants during the current season to schools and other institutions in New York City.

Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Gems For The Indoor Gardener

TRY THESE INDOORS. A Handbook of Unusual House Plants. Allen H. Wood, Jr. 236 pages, illustrated with photographs, indexed. Hale, Cushman & Flint, Boston, 1941. $1.75.

This book supplements Mr. Wood's Grow Them Indoors and continues the good work of inducing amateurs and others to grow something beside the fool-proof aspidistra and crab-cactus. These faithful ones should not be scorned after their long and industrious careers, but surely it is time to try some of the newer plants which come to us in lavish variety from all over the world.

The window gardener will find many of these plants more or less difficult subjects and there may be some failures but, "Not failure but low aim is crime," and many of the attempts may bring glorious success. They appeal to the love of experimenting inherent in all of us and are well worth while, whatever the result.

Sunlight is important, air dryness may make trouble, but first and foremost, the window gardener should study soil conditions and give these exotic plants the combination of materials that they need. The battle will be half won if that is attended to. Mr. Wood gives careful attention to that subject. One may question a little some of the soil mixtures, feeling that for certain plants they are a little rich or a little poor, but the plants will live and probably thrive under the conditions that he names.

It is a pleasure to see several species of the lovely South American alstroemerias given. They are so little known in this country and so well worth while. The Peruvian daffodil (*Hymenocallis calathina,* generally called *Ismene calathina*), which he mentions, when growing with bulbs crowded in a pot, will give bloom both summer and winter. Its white fragrant flowers always attract attention. Most of the butterfly moreas are easy to grow and give a long season of bloom, and the two veltheimias, despite their ugly name with no popular one, delight one with their drooping tubular pink blossoms. The golden chinkerinchee (*Ornithogalum aureum*) is of the easiest culture and its charming orange-yellow flowers last for five or six weeks.

It is worth while to follow the rainbow, which lures one with the fascinating colors of the flowers named in this book, and in growing them one often finds the pot of gold or diamonds or emeralds or rubies at the end of the quest.

SARAH V. COOMBS.

Biography

JOHN AND WILLIAM BARTRAM. Ernest Earnest. 187 pages, indexed. University of Pennsylvania Press, Philadelphia, 1940. $2.

Much of the background of American culture told through the lives of the Bartrams, father and son. A worthy addition to the series of "Pennsylvania Lives" being prepared by the University of Pennsylvania Press.

Early Herbal

DIUERS CHIMICALL CONCLUSIONS CONCERNING THE ART OF DISTILLATION. Sir Hugh Plat. 47 pages, illustrated. 1594. Reproduced for the Herb Lovers' Book Club, Milford, Conn., 1941.

A facsimile of an interesting old volume, produced for the Herb Lovers' Book Club by Mrs. Rosetta E. Clarkson. This predecessor of Plat's "Delightes for Ladies" differs from Mrs. Clarkson's earlier reproductions in that each page has been photographed instead of being set in modern type.

After directions are given for the distillation of oil from such herbs as sage, thyme, lavender, rosemary, and anise, chapters occur on "How to make sundry sorts of most dainty butter with the saide oiles," "How to give a prettie grace both in tast and propertie, unto the spirit of wine," "How to Dissolue both Corall, and Pearle" and "How to preserue damsons, cherries, peareplums, gooseberries, etc., in their owne iuice or sirop without the addition of rosewater."

A Cavalcade of Pharmaceutical Facts

HISTORY OF PHARMACY. Edward Kremers and George Urdang. 446 pages, illustrations, selected bibliography, chronology, glossary, index. J. B. Lippincott Co., Philadelphia, 1940. $4.50.

It is estimated that the 58,000 pharmacies of this country fill more than 165,000,000 prescriptions a year. These prescriptions are written by approximately 135,000 physicians. The magnitude of such an industry had its beginning before the dawn of written history.

The development of pharmacy from the plains of Babylon and Assyria to the modern professional pharmacy of today is an enthralling story, and one closely linked with plant life throughout the ages.

The authors of this History of Pharmacy devote one-third of the volume to the early backgrounds, particularly ancient Egyptian medicine and pharmacy and the rise of professional pharmacy in Italy, Germany and France. They have not overlooked the important role that the Arabs left upon the healing art and its influence upon the Middle Ages. But the major portion of the work is concerned with pharmacy in America from early colonial days to the present time, with emphasis on our struggles through the various wars, the increased use of native products in the early cultivation of herb gardens, largely by religious sects, and the small-scale manufacture of chemicals which later developed into the modern chemical plants of the present time.

The chapters dealing with the establishment of the literature of the field and its economic structure are well worked out. The part played by the manufacturing pharmacist is very scanty and deserves much more attention. Brilliant research has been and is being carried out in the many manufacturing plants of this country.

The bibliography is good. The tabulated chronology and glossary give much pertinent concise information for student and research worker. Yet many facts of real importance to pharmacy have been omitted. Certainly the Badianus Manuscript deserves a place in a history of medicine or pharmacy, and especially in a book dealing with American pharmacy, for this is the earliest medical book written in the New World. Marco Polo's extensive travels depict many important facts. The works of Nehemiah Grew and the development of the microscope by Jansen Brothers paved the way for the rise of the microscopic world that has so much advanced the medical sciences. The theories of disease by Kircher certainly are important, and without the influence of physics and chemistry we would have no modern pharmacy. Yet, all in all, despite certain omissions, the book is the best yet published.

WILLIAM J. BONISTEEL,
Fordham University.

Notes, News, and Comment

National Science Fund. At the meeting of the National Academy of Sciences in Washington the last of April, a National Science Fund was organized as a foundation to receive and administer gifts for the advancement of science. Dr. William J. Robbins was named chairman. The first board of directors consists of 12 distinguished laymen and 20 scientists from the National Academy. Dr. A. F. Blakeslee, one of the members of the board, was chairman of the committee which made a three-year study of the need for such a body to encourage and guide the financial support of scientific research.

Graduation. Exercises for students who have completed the Science Course for Professional Gardeners, also the Two-year Course in Practical Gardening, will take place in the lecture hall of the Museum Building, Thursday, June 26. Students will receive certificates for having successfully completed one of the two-year courses. Mr. E. K. Balls, famous English plant hunter, who is now residing in New York, will be the principal speaker at the graduation. Mr. Balls has explored extensively in Turkey, North Africa, Algeria, South America, and other regions, and many new plants that he has brought from these distant lands are now growing in the Thompson Memorial Rock Garden.

Journals Wanted. There has been a steady demand for several back numbers of the Journal of which the Botanical Garden's supply has long since been exhausted. If members or subscribers are willing to part with any of the Journals listed below, the Garden will gladly refund 10c. (unless the sender wishes to make a gift) for each of the Journals received in good condition. The Journals desired are: March and April 1939; March and November 1940; February and April 1941.

Author. Edwin Beckett, who contributes "Fruits for the Home Garden" to this issue of the Journal, is Superintendent of Middletown Farm, Red Bank, N. J. For many years one of his favorite home-cultivated crops has been fruits for the table, and other gardeners have long looked to him for advice on what to grow in this line and how to grow it.

Bromeliads. M. B. Foster of Orlando, Fla., was a visitor at the Garden the last of May. Through his collections of the Bromeliaceae, especially in Brazil, Mr. Foster has discovered upwards of 40 hitherto unidentified species. On his own grounds in Florida he has more than 400 species in cultivation.

Anthracnose. Major James O. Andes of the Chemical Warfare School of the U. S. Army came to the Garden early in May to visit the laboratories and consult regarding his studies in the genetics of the anthracnose fungus, *Glomerella cingulata.* During the past two years he has been working on this subject with Dr. G. W. Keitt of the University of Wisconsin.

Mrs. William H. Woodin. Since 1924 a member of the Advisory Council of the Garden, Mrs. William H. Woodin died on May 17. She had also served as a member of the Corporation for more than 10 years.

Harry N. Whitford. The first man to obtain a Ph.D. in plant ecology under Dr. Henry C. Cowles of Chicago was Harry N. Whitford, who eventually became a world authority on the economics of rubber production. On May 16, in his 70th year, Dr. Whitford died at his home in Bronxville, N. Y. Since 1925, he had been manager of the crude rubber division of the Rubber Manufacturers' Association. After his graduation from Chicago in 1903, he went to the Philippines, where his research in tropical forest ecology made him an expert on the native forests of these islands. In 1916 he became Assistant Professor of Tropical Forestry in the Yale School of Forestry. He made many trips to the forests of tropical America during that period, and later into Malaya and the surrounding regions. A number of years ago he lectured on the production of rubber at the Garden and contributed material for an article in the Journal of August 1932.

Honor. Dr. William J. Robbins was elected on May 1 to membership in the American Philosophical Society.

Centenary. In April the Royal Botanic Gardens at Kew, England, celebrated the centenary of their existence as a Government institution. In a letter to

Dr. Robbins, Sir Arthur W. Hill, Director, wrote: "I much hope it may not be long before we are able to resume our proper functions with our botanical colleagues throughout the world."

Delegate. Dr. F. J. Seaver has been appointed the delegate of Morningside College, from which he received the degree of B.S. in 1902 and Sc.D. in 1931, at the Centenary Celebration of Fordham University to take place Sept. 15-17, 1941.

Forum. The sixth annual dinner of the Gardeners Forum of the Botanical Garden took place April 19 at the Beekman Tower Hotel. T. H. Everett was toastmaster. Among the professional gardeners from estates around New York who were guests were Ernest Dowton, Anthony Sailer, and Kenneth Hadland. About 80 persons attended.

Degrees. Thomas Laskaris, who has just been awarded a fellowship for the third successive year for study of diseases of *Delphinium* under Dr. B. O. Dodge at the New York Botanical Garden, completed his requirements for the degree of Ph.D. at the University of Minnesota in May. This year's fellowship was awarded by the Garden Club of America. The two preceding grants were from the American Delphinium Society.

John Dwyer, graduate student at Fordham, who has been working under Dr. H. A. Gleason at the Botanical Garden, passed his examination for the degree of Ph.D. at Fordham May 23.

Grant. Dr. William J. Bonisteel of Fordham University, a special investigator at the Garden and a member of the Corporation, has been awarded a grant-in-aid by the Wellcome Foundation for a cytogenetic study of *Digitalis* in the continuance of his study of polyploidy in relation to chemical analysis.

Movie. Pictures taken while the Three-day Short Course in Practical Gardening was in progress have been added to the motion picture of scenes and activities at the Garden. The entire reel was shown to members of all the recent gardening classes and their friends the evening of May 28.

Conference. J. P. Carabia spoke on "The Origin of the Cuban Flora" and Dr. W. H. Camp on "The Genetic Structure of the Blueberries of Eastern North America" at the conference of the scientific staff and registered students of the Garden May 16.

Lectures. Staff members who have addressed scientific groups, garden clubs, and other organizations in recent weeks include:

Dr. William J. Robbins on "Accessory Growth Factors for Micro-organisms" before the New York section of the Society of American Bacteriologists, May 13; "Vitamins and Plant Growth," Research Club of Railway, N. J., May 6; **Dr. Fred J. Seaver,** "Bermuda," Microscopical Society of New York, May 16; **Mr. G. L. Wittrock,** "Plants in the Vicinity of New York Used by the American Indians," Explorer Scouts of the Bronx Council in the Museum Building, Apr. 27; **Mr. T. H. Everett,** "Shade Gardens," Douglaston Garden Club, May 20; "Rock Gardens," Riverside Garden Club of Greenwich, May 26; "Rock Gardening," Flower Hill Garden Club, Manhasset, June 2; **Dr. H. N. Moldenke,** "Treasures of the Watchungs," Garden Club of Montclair, N. J., Apr. 22; "Nature Study in a Metropolitan Area" at the opening and dedication of the Trailside Museum in the Watchung Reservation, May 3; "A Naturalist in Florida," Garden Club of Morristown, May 22. In addition, Dr Moldenke led two trips for the Torrey Botanical Club, combined with the Newark Museum Nature Club the second day, over the week-end of May 24-25 in the Watchung Mountains and Seeley's Notch, N. J., during which 444 wild plants were identified. On May 20, **Miss Elizabeth C. Hall** served as one of the judges in the contest among 20 gardens staged by the Forest Hills Gardens Taxpayers' Association and Woman's Club.

California. Dr. William J. Robbins was named one of the honorary counsellors of the 12th annual California Spring Garden Show which took place in Oakland April 20—May 4.

Groups. Many students, scouts, and garden clubs have been visiting the Garden during the spring, giving attention to the rock garden, woodlands, perennials, shrubs, irises, daylilies, conservatories, and museum building, each under the direction of their own instructor or of a member of the staff. Among the groups since the last of April have been the following:

Students from the New York School of Fine and Applied Art, also from the Department of Landscape Architecture at Columbia University; a botany class from Princeton; students from Manhattan College; from Newbridge Road School, Hicksville, L. I.; New Jersey College of Agriculture; Hasbrouck Heights High School; New Jersey State Teachers College, Montclair; New Rochelle Vocational School; also the New World Club, the Valhalla Garden Club, and the high school group of the Larchmont Garden Club.

Current Literature At a Glance*

National Academy. Among the papers presented at the meeting of the National Academy of Sciences in Washington April 28-29, abstracts of which are given in the May 9 issue of *Science*, are two from members of the Botanical Garden's staff: "Biotin and the Growth of *Fusarium avenaceum*" by William J. Robbins and "The Use of Lethals to Separate the Components of Heterocaryotic Races of *Neurospora*" by B. O. Dodge.

Herbals. Extra copies of the mimeographed leaflet, "Chronological Review of Mediaeval Writings Which Contribute to our Knowledge of the Medicinal Herbs Used in the Middle Ages," distributed by Mrs. Hollis Webster when she lectured at the New York Botanical Garden on May 8, are available from the Garden at five cents each, the cost of mailing. Many of the 25 manuscripts and volumes from the 9th to the 15th century which are mentioned are available for reference at the New York Botanical Garden, where many more such early works are also to be found in the library.

Mediaeval. Twenty gardens which have been illustrated in early prints are shown in the newest picture book of the Metropolitan Museum of Art, available for 25c. Copies were distributed to members of the Metropolitan and the New York Botanical Garden who attended the third of the five lectures on "Mediaeval Gardens and Plant Lore" given this spring by the two institutions.

Botany. Among recent botanical papers of which reprints have been received are "A New Genus of Compositae from Northwestern Alabama" by Earl Edward Sherff, Field Museum, Chicago; "The Genus *Myriangium* in North America" by Julian H. Miller, reprinted from *Mycologia;* "A Monographic Study of the Genus *Thyronectria*" and "Two Diseases of *Gleditsia* Caused by a Species of *Thyronectria*" by Edgar V. Seeler, Jr., reprinted from the Journal of the Arnold Arboretum; and the "Presidential Address on Specimens, Species and Names" given by E. W. Mason before the Linnean Society of London and published in the Transactions of the British Mycological Society. Mason speaks of the study of moulds as "the study of plants as they do not occur."

Santa Barbara. The annual report of the Santa Barbara Botanic Garden speaks especially of the project to study *Ceanothus* in cultivation, and mentions the wild flower field as one of the garden's greatest attractions for the public. Formerly called the Blaksley Botanic Garden, the Santa Barbara institution assumed its new name in 1939. It was established in 1926 by the Santa Barbara Museum of Natural History on land purchased and presented by Mrs. William H. Bliss as a memorial to her father, Henry Blaksley. Its 30 acres are devoted exclusively to native California trees, shrubs, and flowers.

Walking Trips. Seasonal schedules for hikers in the region of New York are issued by several groups, among them the Torrey Botanical Club, the Woodland Trail Walkers (Ho-ho-kus, N. J., Ernest A. Dench, Director), and a group of clubs represented in *Walking News*, issued by William Hoeferlin, 556 Fairview St., Brooklyn, N. Y.

Growth Substances. The comprehensive discussion on "Growth Substances and their Relation to Plant Growth," given by Paul E. Tilford before the American Institute of Park Executives, is published in the February issue of *Parks and Recreation.* Mimeographed copies of it are available from the magazine, Box 422, Tulsa, Okla.

Welwitschia. The only known specimens in America of *Welwitschia mirabilis*, strange desert plant of southwest Africa, are in cultivation at the Montreal Botanical Garden, where they have been started from seeds obtained from Portugal. Henry Teuscher, Director of Technical Services at the Garden, writes about this oddity in the Botanical Gardens section of *Parks and Recreation* for February.

Fuchsias. The third Fuchsia Annual published by the Fuchsia Society (England) has been issued as a 43-page illustrated book, opening with a plea ". . . to keep our gardens alive . . [and] keep our Society going."

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* All publications mentioned here—and many others—may be found in the Library of the Botanical Garden, in the Museum Building.

THE NEW YORK BOTANICAL GARDEN

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

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The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891 The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

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CAROL H. WOODWARD, Editor

July 1941

PEDILANTHUS, THE SLIPPER-FLOWER — Cover Photograph by Fleda Griffith
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APPRECIATION FROM AN AMATEUR

A recent magazine article by Donald Culross Peattie has aroused some happy memories and brought forth a word of appreciation for the New York Botanical Garden from a woman whose active interest in the Garden dates back to the first dozen years of the century. Part of a letter sent by Miss Julia T. Emerson of Somers, N. Y., a niece of Ralph Waldo Emerson, to Mr. Peattie is reprinted here with the writer's permission.

"My dear Mr. Peattie:

"Yesterday was made peculiarly pleasant by your article 'A Naturalist in the City' in the May Atlantic Monthly. I want to thank you from my heart for your tribute to the scientists on the top floor of the Museum Building at the New York Botanical Garden. You went there as a trained botanist, but I can assure that they are as friendly and cordial to the amateur.

"Almost a generation ahead of you, I spent many happy months and years above the 'No Admittance' gate, and made friends who were also amateurs, each working in some branch of botany under heads of their departments, and freely exchanging our discoveries and experiences.

"This experience has meant an intelligent understanding of the plant world, from trees to hepatics, mosses, and even many lowlier beauties, so one is never lonely in the country being among so many friends and knowing them by name.

"Thank you for expressing what many of us are only dumbly aware of, and for arousing so many happy memories."

The present day finds the same type of amateurs working on problems of botany and horticulture. Whenever individuals or groups come to the New York Botanical Garden with an earnest desire to learn about plant life, they still find a cordial welcome from the institution and ready assistance from those members of the staff who are equipped to answer their questions and guide their further studies.

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JOURNAL
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VOL. 42 JULY 1941 NO. 499

Succulent Plants Of The American Deserts

By E. J. Alexander

(The second of a series of articles based on the collections of cacti and other succulent plants at the New York Botanical Garden. "Desert Cacti of the Americas," also by Mr. Alexander, appeared in the Journal for February 1941.)

Photographs by Fleda Griffith.

WHILE cacti are considered the most characteristic plants of American deserts, they are by no means the only plants present in those areas. There are also short-season annuals, perennials, and shrubs with leafless rest periods which are as much a part of those rocky desert lands and fully as typical as are the cacti.

Nor are the cacti the only plants of succulent habit present, for associated with them in the more arid areas are always others which have an equally fleshy structure, and hold an equally important place in the desert picture. These plants are in no way related to the cacti, but merely show a response to their environment, giving a fine example of how those plants that are subject to the same life conditions will become adjusted to their surroundings by the development of a similar structure. It is surprising to note how remarkably few types of growth these plants exhibit; in fact, only two. They are (1) the rosette form wherein the leaves are crowded into terminal clusters with or without a fleshy or woody stem, and (2) the strictly stem-succulent form, wherein the leaves are short-lived, whether fleshy or membranous in texture, and the stem assumes the major life-functions. The monocotyledons invariably take on the rosette form while dicotyledons show more diversity in their response. In speaking of the different groups of these plants, we shall see how many variations have been developed by these two forms.

The largest single group is in the Amaryllis family with the genus *Agave*[1] (including the century-plant and its relatives) which contains about 300 species, all strictly confined in natural occurrence to the Americas and their adjacent islands. The great majority are natives of

[1] Correctly pronounced, when used as a botanical name: a-gah'-vy.

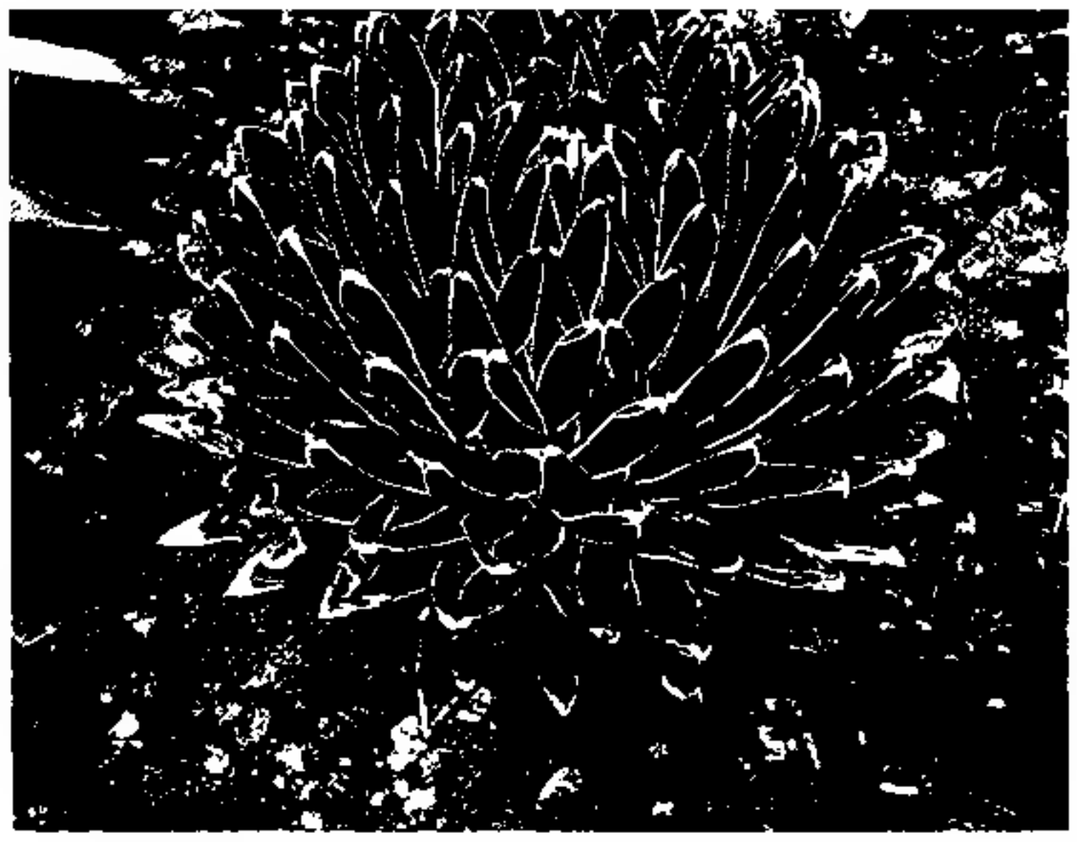
Mexico, where most of them are called MAGUEY. They all have hard, fibrous leaves with a spine at the tip and either smooth or spiny margins, the majority more or less succulent in texture and covered with a waxy coating which tends to retard loss of moisture by evaporation. There is no great variation in the form of growth of these plants other than the presence or absence of a woody trunk, the width of the leaves and the presence or absence of spines on the leaf-margins. There is also a small group with deciduous leaves, where the plant passes its rest period as an underground rootstock. There are only two forms of inflorescence, a spike (or a raceme) and a panicle (branched inflorescence). The flowers are mostly greenish, with a few yellow or orange ones for variation, so that their decorative value lies in their form rather than in their flowers. The name "century-plant" has been applied to most of them in the mistaken idea that they flower when a hundred years old, but in actuality the plants usually flower at from ten to fifty years of age depending upon the species, also upon the growing conditions. In the majority of cases the rosette dies after flowering but not without producing one or more basal or root offshoots by which propagation may be effected. The inflorescences vary in height from three to forty feet, the leaves range in length from a few inches to six feet.

A number of species of *Agave* are of great value as a source of fiber which is obtained from their leaves. The best known of these is *A. sisalana* from which sisal hemp is obtained, *A. fourcroydes* from which henequen is obtained, and *A. Lechequilla* and *A. Ixtli* from which ixtle is obtained.

Agaves are popular as ornamental plants as they are easily grown and not subject to many diseases or insect pests. The usual ones cultivated are *A. americana* and *A. neglecta*, both commonly called century-plant. They eventually reach a large size, and their stiff gray-green or variegated leaves, appearing almost artificial, make them very showy. Some of the rarer types, such as *A. Victoriæ-Reginæ*, *A. filifera*, *A. Shawii*, *A. attenuata*, *A. Schidigera*, and *A. stricta*, are being more widely grown as they are made available in the trade. All are highly recommended as pot plants as they are attractive and need no great amount of attention, being able to go for some time without water.

Another group of succulents in the Amaryllis family is in the genus *Furcraea*, whose members are very similar to the agaves but have thinner and harder leaves. They have inflorescences 20 or more feet tall, with flowers somewhat reminiscent of those of yuccas. Fiber is also obtained from some of them. One species, *F. longaeva*, which reaches 50 feet in height, is the tallest of the tree-forms in the Amaryllis family. After flowering, the whole plant dies without producing the usual basal offshoots, so propagation can be effected only by seed. It is known only from a restricted area in southern Mexico.

A. Lechegulla, from which a fiber is obtained.



A. Victoriae-Reginae, one of the rarer species

the hedgehog agave, one of the narrow-leaved types.

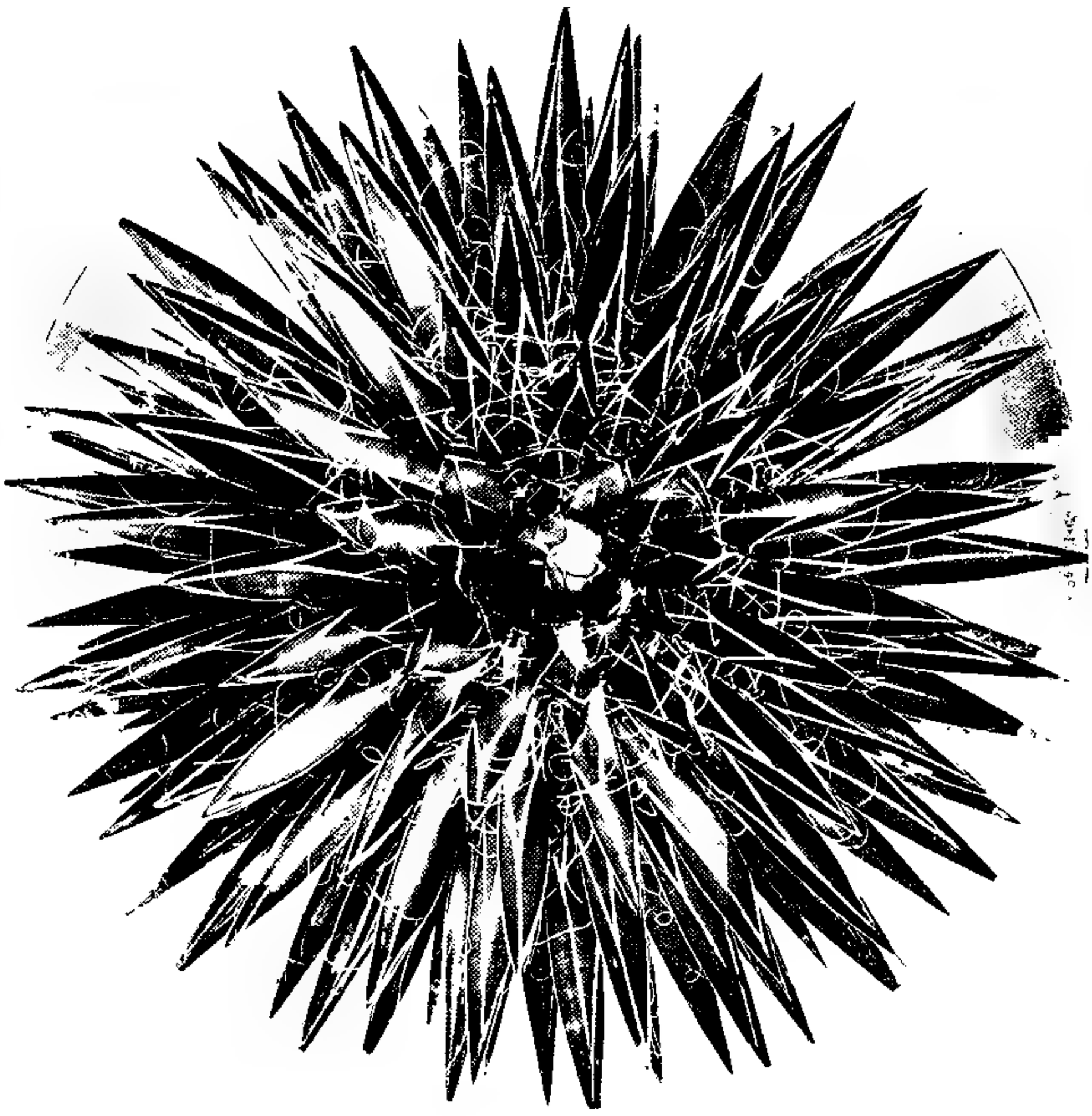
exhibiting a characteristic design.

A. Roezliana, a little known species.

CENTURY-PLANTS IN SOME OF THEIR MEXICAN FORMS

A. attenuata, whose flower stalk in the wild sometimes reaches 10 feet

The only other succulent group in the Amaryllis family is the genus *Beschorneria* with some six or seven species in Mexico. In habit the plants are much like the soft-leaved, smooth-margined agaves, but the leaves are still more soft and pliant. The inflorescences, which rise from 3 to 5 feet high, have red bracts, and along the drooping branches are borne tubular red, green or purplish-marked flowers. These plants are rare and little known even where native, but are desirable subjects. The



The symmetry of a century-plant *Agave filifera, photographed from above.*

New York Botanical Garden has five species in its collection, but positive determination of them must await their flowering.

There is frequent confusion among amateurs in distinguishing agaves from the aloes of the Old World. True, they are very similar in appearance, but the agaves have hard, firm-textured, fibrous leaves which

do not break when bent, but must be cut, while aloes have soft-textured, non-fibrous leaves which snap off when bent, and show their structure to be a soft-horny shell filled with gelatinous pulp. The leaves of aloes completely encircle the stem at their base, while agave leaves are only half encircling. Furthermore, aloes belong to the Lily family, wherein the ovary is within the base of the flower tube, while agaves belong to the Amaryllis family wherein the ovary lies below the flower tube.

The non-bulbous desert members of the Lily family in America, while not succulent, belong so completely to the desert lands that their inclusion here is necessary. Most commonly seen are the species of *Yucca,* which are characteristic plants of our own southwestern and the northern Mexican desert areas. The yuccas have sword-like, spine-tipped leaves with non-spiny but sometimes saw-toothed margins, but their texture is thinner than that of the agave leaves, and even more hard-fibrous with no accompanying succulence. A fiber is also obtainable from them. Some species are native to the sandy coastal sections of our southeastern states, one going back into the mountain regions nearby, and all but a few are similar enough in general appearance to offer no confusion as to their relationship. The few differing ones, having narrower leaves than the others, might be confused with *Nolina* or even some few species of *Agave.* Flowers or fruits, of course, offer an immediate answer, but unaccustomed eyes are likely to confuse younger plants, and no infallible differentiation is possible. The leaves of nolinas are the narrower, softer and more flexible, while the agave leaves are harder and stiffer than the yuccas, but these characters are not always detectable by amateur's eyes, and one may have to wait for flowers. The two most spectacular of the yuccas are the ones most familiar to travelers in the southwestern desert areas. *Yucca Whipplei,* commonly called Our Lord's Candle, is one of the most beautiful sights of the desert when in flower, its great spire of bloom rising twelve feet above the rapier-like foliage and bearing hundreds of flowers. *Yucca brevifolia,* the Joshua-tree, is the grotesque sentinel of the southwestern deserts, without whose presence no picture of that area seems complete. Its dagger-like leaves and drooping flower-clusters are quite distinctive and mark it clearly apart from its relatives.

Closely allied to the yuccas is the genus *Hesperaloe,* a small group of two or three species of the Mexican border region with narrow, yucca-like foliage and few-branched panicles of red or orange flowers.

In a different tribe from the yuccas, but resembling them in manner of growth, though with more taper-pointed, flexible leaves, is a group of plants little known in cultivation. The three genera *Nolina, Calibanus* and *Beaucarnea* differ mainly in technical fruit structure. All have 1- to 12-foot panicles of flowers individually less than an inch long, followed by capsules of globular seeds that are buff or tan in color. One of the nolinas, *N. Parryi,* is an inhabitant of the same region where *Yucca*

Agave pendula, bearing its characteristic flower stalk four feet long.

Whipplei grows and is frequently confused with it. The similarity is marked at a distance, for the spire-like panicles of flowers look much alike, but the nolina flowers are very small, and the seed-pod has three papery lobes with a few pale-colored round seeds.

Similar in form of growth but with sharp, spiny-toothed leaf-margins, and flowers so crowded on the inflorescence branches as to conceal them, are the members of the genus *Dasylirion*, which are commonly called SOTOL. The greatly expanded, concave leaf bases are frequently seen inverted in vases in florist shops and in decorative arrangements under the name of spoon-flowers or cactus-spoons. *D. Wheeleri* is the one most frequently used for this purpose. This is regrettable, for the plant must be destroyed if the leaf-bases are to be obtained in good condition. In

VIEW IN THE GARDEN'S NEW WORLD SUCCULENT HOUSE

The tall plant in the center background is a Beaucarnea, with a Yucca on either side. In the center is a Dasylirion, with two large Agaves toward the front. In the extreme foreground at the left is a Hechtia, while two flower stalks of another Hechtia rise nearly 10 feet from a plant in the rear.

the interest of conservation it is hoped that those dealing in the cactus-spoons will raise their plants commercially instead of using wild plants.

Some genera in the Pineapple family which are not at all succulent are nevertheless often grown in succulent collections as they require the same conditions. Members of this family may be recognized when not in flower by the scurfy or scaly covering on the under side of the leaves. The two genera *Dyckia* and *Hechtia* are the most common and frequently seen; *Dyckia* with single or branched spikes bearing showy yellow, orange or vermilion flowers, *Hechtia* with large inflorescences containing many small white or greenish flowers. Both are attractive also for their hard, stiff, spiny-margined foliage and clustering form of growth. The genus *Puya* has some species from high in the Andes suitable for the same cultural conditions. These plants have more flexible leaves with or without spiny margins, and their inflorescences have reddish bracts and steel-blue flowers. They are rarely seen and difficult to obtain, but are worth the effort.

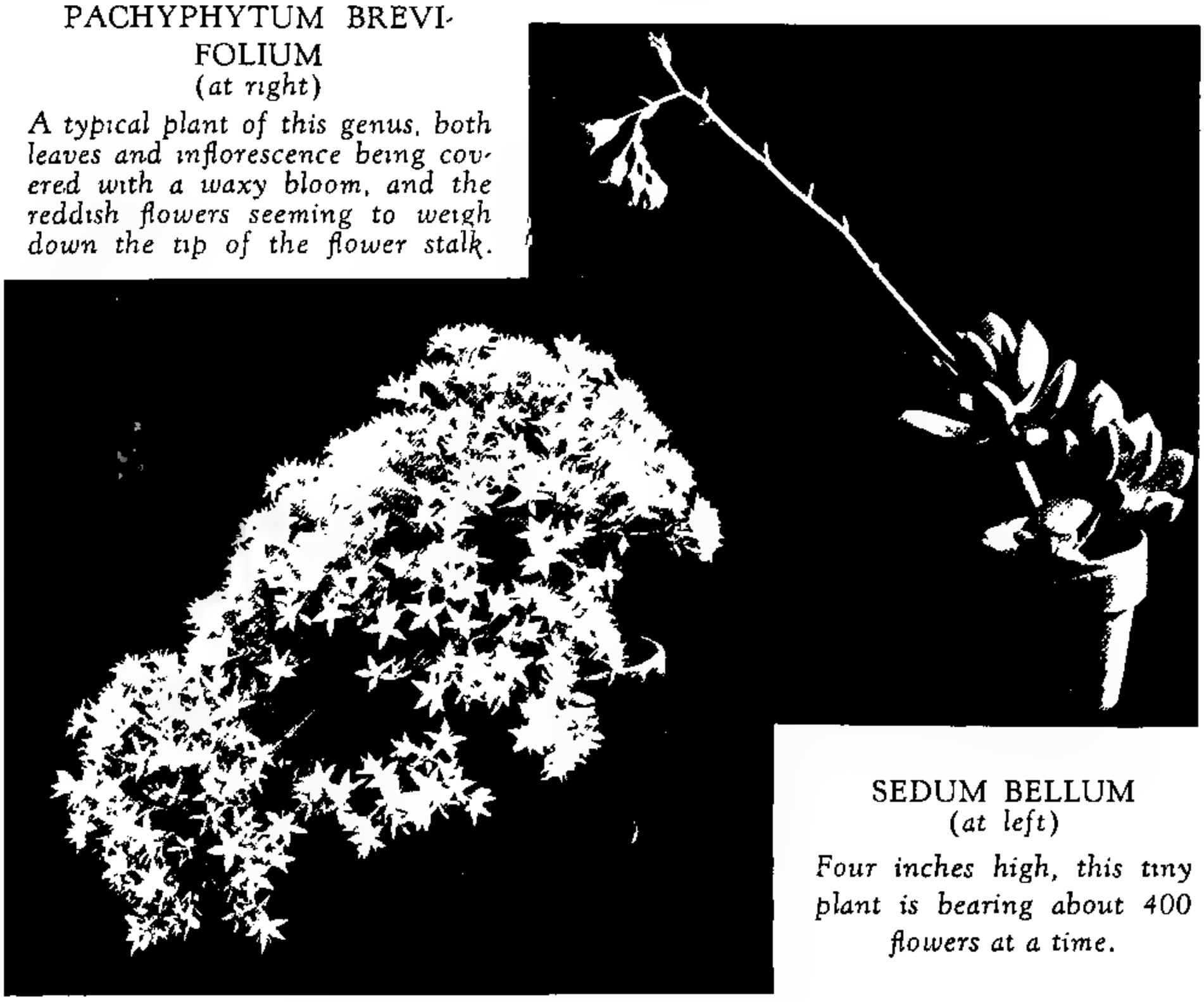
While the succulent euphorbias usually grown are mostly African plants, there are a few American and Mexican species occasionally seen in collections. The most common one is *Euphorbia antisiphilitica,* the CANDELILLO of Texas and Mexico, consisting of a crowded clump of slender upright stems which rarely flower. This plant is used medicinally, and in addition the waxy coating of its stem is said to furnish an excellent coating for phonograph records. The wax is also used to make candles. Another species, *E. pteroneura,* with succulent, green, sharply angled stems, short-lived leaves, and insignificant flowers, is also sometimes grown. At the New York Botanical Garden we have a few plants of *E. oaxacana,* a rare and interesting species with very short-lived leaves and plentifully borne clusters of flowers along its rather straggling and crooked branches. The pink structures that appear to be the petals are appendages on the glands of the involucre surrounding the simple, inconspicuous true flowers that are characteristic of this group. So far as any records show, these are the only plants of their kind in cultivation.

Better known and more popular in cultivation are the species of *Pedilanthus,* called slipper-flowers. Most of the species are bushy plants of upright, frequently zigzag growth, with clusters of bright red involucres shaped like a bird's head, but one recently introduced species has green, upright-hooded flowers.

A very interesting family of semi-succulent plants is the Fouquieriaceae or Ocotillo family. There are only eight species known, seven of them in the genus Fouquieria. One of these, *F. splendens* is one of the familiar plants of our southwestern desert where it is called OCOTILLO or devil's coach-whip. It is branched only at the ground, and the dead-looking, thorny, upright or arching stems are covered for only a short period with green leaves and tipped with sprays of scarlet flowers—

PACHYPHYTUM BREVIFOLIUM
(*at right*)

A typical plant of this genus, both leaves and inflorescence being covered with a waxy bloom, and the reddish flowers seeming to weigh down the tip of the flower stalk.



SEDUM BELLUM
(*at left*)

Four inches high, this tiny plant is bearing about 400 flowers at a time.

bare the rest of the year. Some of its Mexican relatives have white or purplish flowers and are more definitely branched in their growth, the white-flowered one forming a grotesque-looking shrub with several stems shaped like carrots turned upside-down and branched from the tip. The one other species in the family is considered as a distinct genus, and it is indeed one of the most remarkable and grotesque plants in North America. It is a tree up to 70 feet tall, but a tree constructed like nothing that seems to belong on this earth. The trunk is 3 feet in diameter at the base, and tapers rapidly upward forming a weird inverted cone with many short, persistent, twig-like growths along its entire length. These growths are really spine-tipped inflorescence branches, bearing a few leaves and yellowish flowers. There is also a cluster of twig-like panicles from the apex of the tree, which bear still more flowers. Strangest of all, this great growth is not woody, but so soft and spongy that it frequently becomes topheavy and leans over, shaping itself into still more weird forms. Sometimes the trunks become hollow and are inhabited by bees. This tree is known only from a small area of Lower California where it is locally called CIRIO. Botanically its name is *Idria columnaris*. Associated with it in the same region is another strange-looking tree called COPALQUIN, standing about 15 feet in height and having a spread of 30

to 40 feet. It is a member of the Cashew-nut family (Anacardiaceae) and botanically is known as *Pachycormus discolor*. This is another tree with soft spongy wood. Its main branches, which are either prostrate or spreading, are always gnarled and contorted into weird elephantine forms, the effect of which is heightened by the peculiarly brown and skinlike bark that peels off each year, exposing the spongy, greenish inner bark. The leaves are small and pinnate, the red or pink flowers in showy terminal panicles.

Returning to plants of horticultural rather than scenic value, the Orpine or Stonecrop family (Crassulaceae) ranks high, for its forms are more varied even than those of the Amaryllis family, the number of genera is much greater, there is more beauty in the form and coloring of the flowers and leaves of its members, and a large representation can be grown in a fraction of the space necessary for the same number of agaves. The genus *Sedum* is of course widespread over the northern hemisphere, but the North American group is mostly Mexican and not hardy. The few hardy American species are frequently seen in cultivation, but are by no means as popular as the tender ones. Of these, the creeping *S. mexicanum* and the shrubby *S. praealtum* are so widely used that they have come to rank among the commonest of pot plants. There are many other species becoming popular as they are made available by dealers.

Almost the entire gamut of succulent leaf-shape is to be found in the genus *Sedum*. In the small-leaved and creeping types, there are some with slender scale-like leaves, such as *S. moranense* and *S. cupressoides,* and others with longer leaves, such as *S. diffusum* and *S. mexicanum.* There are the sausage-leaved types such as *S. guatemalense, S. pachyphyllum,* and *S. allantoides,* which are somewhat shrubby, and the newly discovered *S. Morganianum,* a hanging-basket type of great ornamental value and interest. Broad-leaved forms are *S. rhodocarpum, S. versadense* and *S. bellum,* and in the heavy-leaved types are included such as *S. Treleasei* and *S. Adolphii.* Most of these plants are chiefly ornamental as foliage plants, but some few are attractive in flower. *S. bellum* and *S. diffusum* are quite nice white-flowered ones, *S. mexicanum* a good yellow, and *S. versadense* a good pale pink.

A number of species of *Villadia* are frequently seen in specialists' collections. These plants are very similar to the sedums but the petals are united, making a tubular or bell-shaped corolla with recurved petal-tips.

The group of genera centered in *Echeveria* [2] is by far the most beautiful of all American succulents, for their foliage runs through many shades of green, variously tinted with red and purple, and reaches its greatest heights in the many species with glaucous or whitened leaves with many

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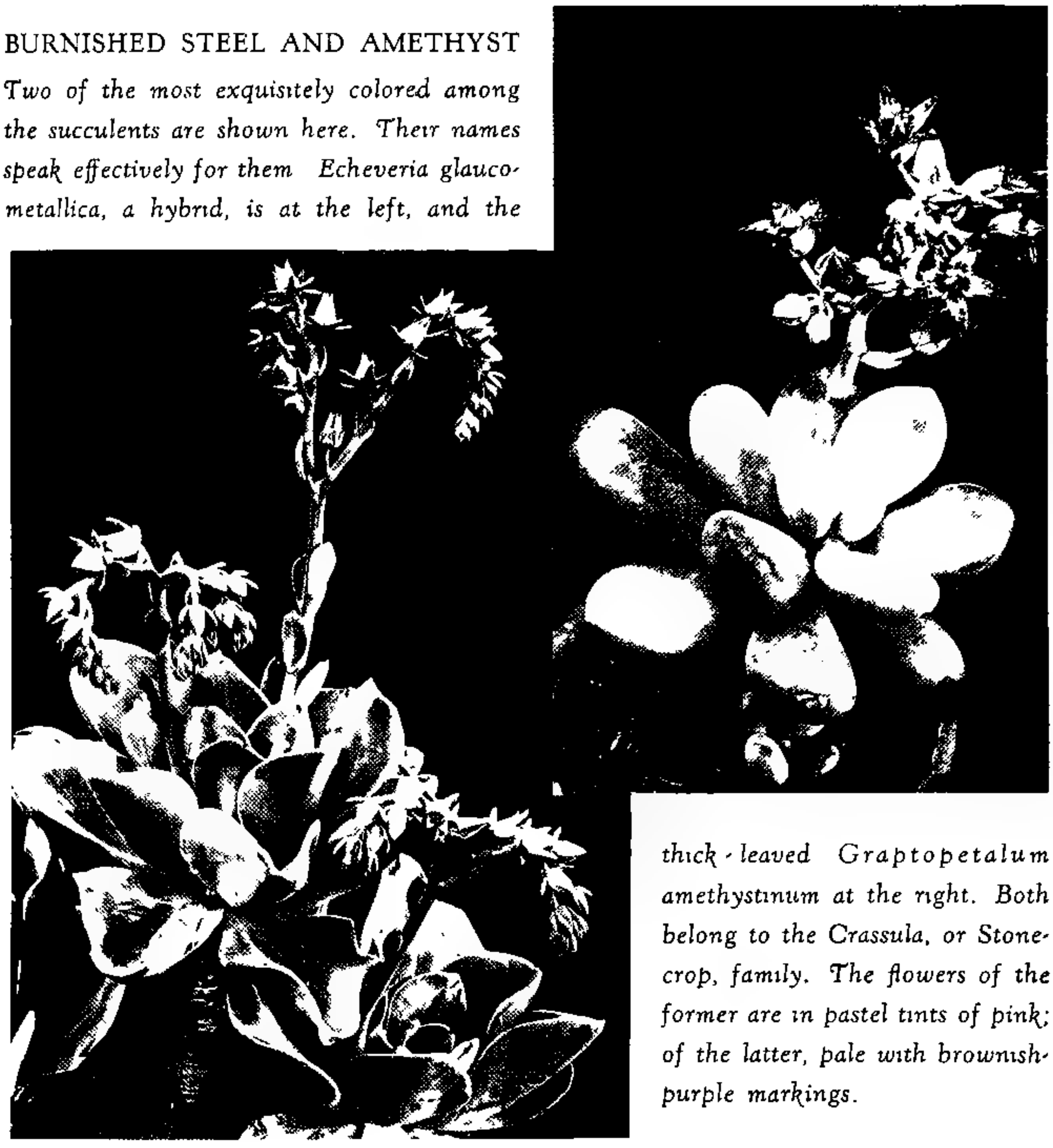
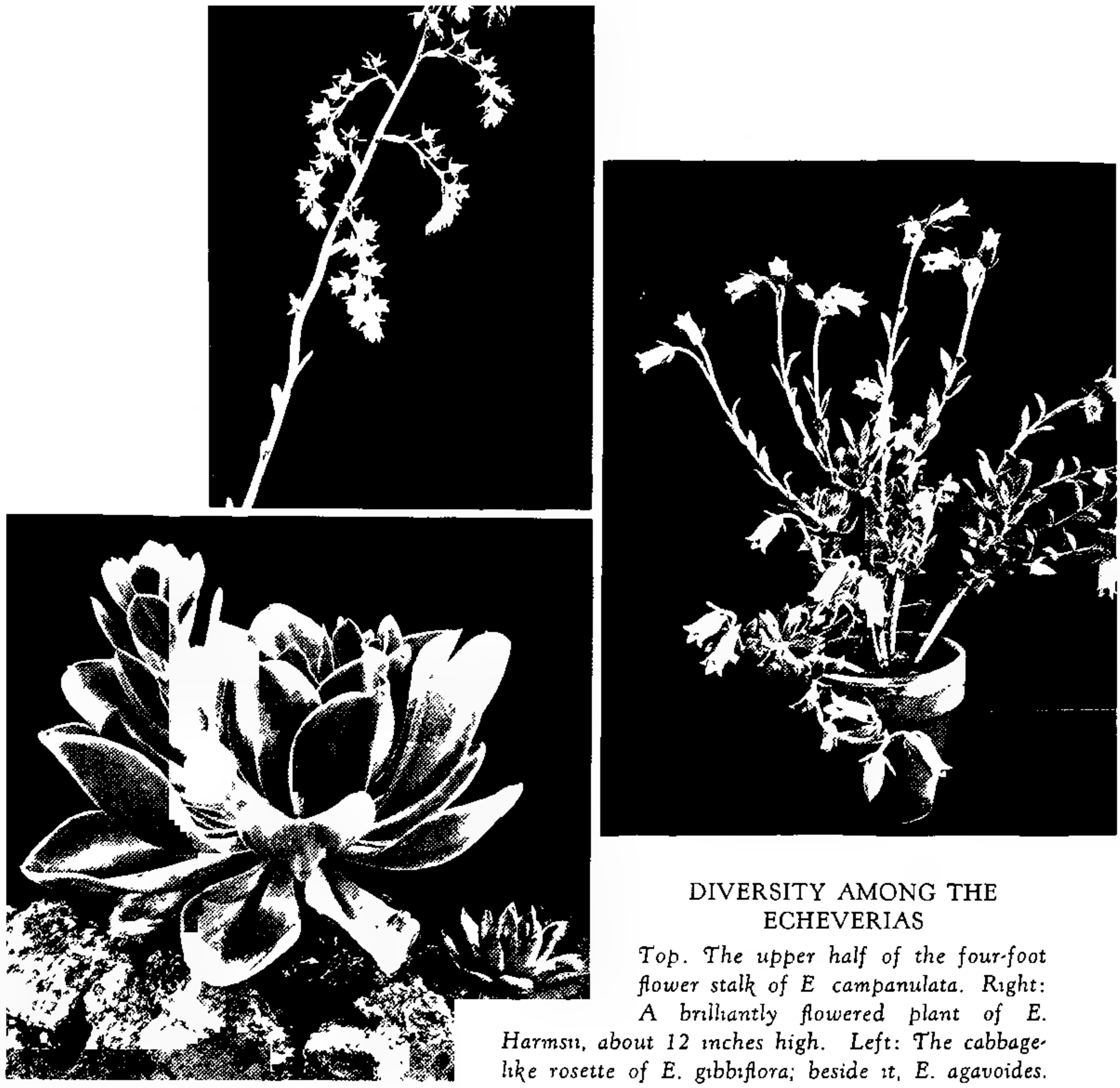
[2] Named for a Mexican botanical draughtsman, Atanasio Echeverría, hence best pronounced with a *ch* rather than a *k* sound in the first syllable.

pastel tints of pink, rose, blue and amethyst. The genus *Dudleya* is the least cultivated of this group, but its members are mostly beautiful foliage plants with long-pointed, strap-like, nearly white leaves forming large rosettes. The flowers are yellow, white, pink or reddish. Of the 80 or more species, but five or six are in cultivation, possibly because of their general similarity of form and coloring. Two small genera, *Pachyphytum* and *Graptopetalum* are occasionally seen. The former has somewhat tubular-appearing flowers, frequently shorter than the calyx; the latter has whitish, flat-opening flowers spotted and streaked with red-purple. In both genera are some exceedingly beautiful-foliaged species, mostly blue-green and glaucous and with wonderful amethystine tints.

BURNISHED STEEL AND AMETHYST

Two of the most exquisitely colored among the succulents are shown here. Their names speak effectively for them Echeveria glauco-metallica, a hybrid, is at the left, and the thick-leaved Graptopetalum amethystinum at the right. Both belong to the Crassula, or Stonecrop, family. The flowers of the former are in pastel tints of pink; of the latter, pale with brownish-purple markings.





DIVERSITY AMONG THE ECHEVERIAS

Top. The upper half of the four-foot flower stalk of E campanulata. Right: A brilliantly flowered plant of E. Harmsii, about 12 inches high. Left: The cabbage-like rosette of E. gibbiflora; beside it, E. agavoides.

Echeveria, the largest and the best known genus, is, as might be expected, the most variable one. Its leaves run all the way from nearly tubular in form to flattened ones as big as saucers, and in size from rosettes an inch across to those as big as over-grown cabbages, and somewhat similar in form. The flowers are sometimes in stiff upright spikes and just as often in loose panicles with recurved or drooping branches, or in one-sided arching sprays, often as not two-parted. There are a few yellow-flowered species, but most of them are brilliant orange, red, scarlet or carmine, with many variations in tone and in combinations of one or two of these colors with yellow; sometimes they are in soft pastel shades, always with unusual shadings and tinges that are not matched by any other succulents. Grown primarily for the beauty of their foliage, those which bloom at the Christmas season furnish an exceedingly welcome and different note. Finest in this performance are a group of species related to

Echeveria setosa, its red-tipped leaves completely covered with glistening, bristly hairs, and E. elegans, with translucent, blue-white leaves.

E. gibbiflora, which send up flower sprays one to four feet tall. *E. gibbiflora metallica* is perhaps the most choice of these for its foliage cluster is as large as a loose cabbage head and a metallic gray-green in color strongly shaded with amethyst tints of various tones, no two plants exactly alike. Another excellent and small-growing one is *E. carnicolor* with flesh-tinted leaves and bright coral-red flowers. A number of species are of the hen-and-chickens type of growth. These mostly have the one-sided, recurved flower sprays, but differ in foliage color, some blue-green or whitish blue; one, *E. elegans,* translucent blue-white; another, *E. Derenbergii,* pale yellow-green with white overtone; *E. setosa* a bright green covered with stiff, glistening hairs which extend to the vermilion, yellow-tipped flowers. Two other hairy types are justly popular and desirable, *E. leucotricha* with hairs so dense that the entire plant appears blue-white with brown-tipped leaves, and *E. pulvinata* with shaggy rust-colored stems and ashy-green, brown-tipped leaves. The flowers of both are in long stiff spikes, in the former red, in the latter orange.

There are many other echeverias and related plants too numerous to mention here, where we have presented a mere outline of the group; nearly all are easy to grow, but it must be remembered that all of them are children of the sun, as are likewise nearly all of the plants mentioned in this article, and most of them are admirably suited for dry air conditions such as exist in most of our homes. We can grow them there, where many a moisture-requiring plant would languish, their principal needs being sun, a little water and good drainage, with care to keep off the various insect pests to which they are subject. Their beauty and ease of culture are causing them to become more and more popular, as the dealers and florists make them available, but the rarer types will probably always have to be viewed in greenhouse collections such as are at the New York Botanical Garden and similar institutions.

Gardens Of Cloister And Castle

As Presented in the Closing Lecture of the Series on Gardens and Plant Lore of Mediaeval Europe Given Through the Collaboration of the Botanical Garden and Metropolitan Museum of Art

I. ***By H. W. Rickett***

IT IS SOMETIMES SAID that in gardening as in other arts utility came before ornament; that pleasure gardens grew out of the cabbage-patches and apple-orchards of agriculture. The truth is more complex. Certainly vegetables, fruit trees, and medicinal herbs have contributed to pleasure gardens. But man's desire for beauty and for pleasurable seclusion is as old as his agriculture. Man's relations with plants have also been partly religious, and from the beginnings of history he has constructed gardens as places in which his gods might dwell and be properly honored. It would be impossible to give some sort of picture of the gardens of early mediaeval Europe, particularly those of the monasteries, without taking all these factors into account.

The mediaeval period began with the disintegration of the Roman Empire; for convenience we may say in the 5th century A. D. What occurred was more than the passing of a political system; it was the break-down of a civilization. The well tilled fields, the beautiful and luxurious villas of the Roman provinces were overrun by hordes of wild and fierce fighters, wandering tribes living by hunting and by pillage, who destroyed most of what they found before they founded their own states upon the ruins. The barbarians had themselves no garden craft, and had to begin over again to learn what the Romans knew. In the interval gardening practically perished except in fortunate spots here and there. Many species cultivated in England by the Romans had to be introduced again. The invading Saxon tribes had not even names for common herbs and vegetables, and adopted those of the Romans. Cherry is an early English attempt to say Cerasus, lettuce or lactuce comes from Lactuca, mint from Mentha, turnip from Napa, parsley or paroselye from Petroselinum.

In later times the Teutonic tribes evolved their own arts and crafts and contributed beautiful buildings and gardens to Europe. But for many centuries warfare and hunting were the preferred and honorable occupations. Much of Europe was still covered by forest, and the abundant game sufficed for the maintenance of a comparatively small population. Glory and wealth were still to be obtained by violence and robbery, and much of the creative energy of the early mediaeval centuries was devoted to the techniques of murder and of defense. Fields, villages, and gardens

might flourish for a season; on the morrow they would be blackened and bloodstained ruins. Pillage and fire, sudden death, captivity, and torture were the limiting conditions of civilized life. It is not a pretty picture; but without reference to it the dwellings and gardens of those times are incomprehensible.

The chief link between mediaeval culture and the civilized past was the church. The monasteries which flourished in northern Africa in the latter days of Rome escaped the general ruin and made possible an unbroken tradition from Roman into mediaeval times. Often the religious brotherhood seems to have occupied a Roman villa. Saint Augustine speaks of the founding of his fellowship as follows: "I assembled, in a garden that Valerius had given me, certain brethren of like intentions with my own, who possessed nothing, even as I possessed nothing . . . "[1] Such must have been the beginning of many a monastery; often the beginnings of a religious house must have been the ruins of a villa. The cloisters were simply the portico or peristyle of the old Roman garden. Certainly the form of the Roman garden, surrounded or partly surrounded by buildings and covered colonnades, was ideal for the purposes of the monks, giving them at once the seclusion and the communal life which they desired.

Another source from which cloisters may have been derived is the porch or paradise of the early Christian church, which in turn had been derived from the atrium or forecourt of a Roman house. In any case we can best understand the cloister if we think of it as derived from a Roman dwelling, of which an enclosed garden was an integral part. It is essential also to remember that the cloister was not merely an arcade beautified by the stone-cutter's art; it was actually the dwelling-place of the monks. Here in these ill-lighted, wind-swept, and often bitterly cold arcades, the brethren, clad in their long woollen robes, passed much of their time and did much of their work. The garden in the middle served, as gardens have always served, for adornment and recreation.

One of the earliest accounts of monastic gardens is the story of St. Rhadagond, who in the 6th century retired to Poitiers and founded a nunnery, where she and her fellow-nuns labored with their own hands in the establishment of a beautiful garden. The bishop-poet Fortunatus, who often visited the garden, wrote, "Of all the fragrant herbs I send none can compare in nobleness with the purple violet. They shine in royal purple: perfume and beauty unite in their petals. May you show forth in your life what they represent."[2]

With the growth of the monasteries and the increased necessity for self-support, the gardens naturally became more extensive and complicated. We find few detailed accounts of the earlier ones, but monastery

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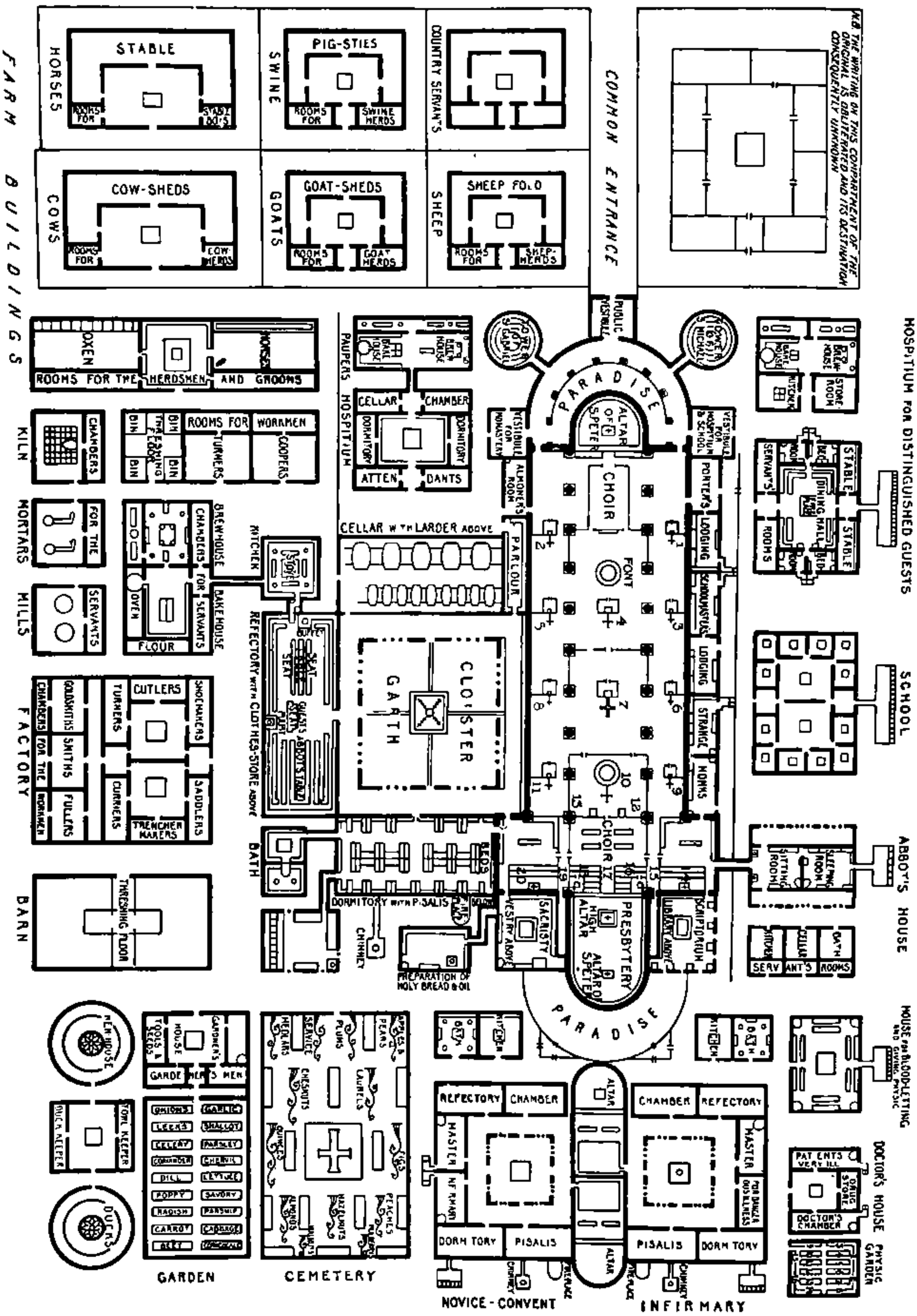
[1] Gothein, Marie Louise. *A History of Garden Art.* Vol. I, p. 171, 1928.
[2] Rohde, Eleanour Sinclair. *The Story of the Garden.* p. 27, 1926.



Proposed plan for the monastery of St. Gall in Switzerland, dating from around 900.

gardens are mentioned in writings dating from the 9th century. From about that time also comes the well known plan proposed for the monastery of St. Gall. Whether or not this plan was ever realized does not matter; it gives us a very clear and complete picture of the extent and complexity of such an establishment with its numerous gardens. There was a garden of herbs and pot-herbs (vegetables) laid out in symmetrical oblong beds. There was a fruit orchard in the cemetery. The plants for these gardens are named on the plan, though it is true that they are mostly copied from Charlemagne's Capitulary, and not all of them would be expected to grow well in Switzerland. Grainfields and pastures were doubtless without the walls. A great monastery was a self-contained world, not only feeding itself but caring for its sick; moreover in accordance with its religious professions, it was a sanctuary for oppressed and troubled mankind and a hospital for the ailing in mind or body who might knock at its gates. There was consequently a physic garden and rather extensive quarters for a physician and his patients. The monks were doubtless assiduous and expert gardeners and familiar with the uses of plants so far as they were known in those times. Certainly in later and more luxurious times they became versed in the preparation of herbs for a sumptuous table and in the concoction out of them of curious and delicious beverages. Because of the international character of the religious orders, valuable plants and valuable knowledge of their virtues might be sent from one end of Europe to the other and even from the distant Orient.

There is no indication on the plan of plants in the cloisters, but almost certainly plants would be grown there. Cloisters of the time seem to have been usually planted with grass and trees or shrubs; in the grass there might be a profusion of small flowers in the pleasant mediaeval fashion. In the center there was usually (as on this plan) a fountain or basin, which served for washing and for drinking as well as for ornament. Perhaps also in the cloisters the lilies and roses were grown that were needed in profusion for religious observance. On holy days, which were numerous, altars and shrines, walls and pillars were decorated with flowers and the clergy marched in procession wearing garlands of flowers. The growing of flowers for these purposes was usually the duty of the sacristan, and in many monasteries a place was designated especially as the sacristan's garden. Another place where flowers might be grown was in the paradise at either end of the great church. These were originally derived from the porches of Roman houses. The name signifies a park or enclosure (the modern connotation of the word being a subsequent addition). Later they were often enclosed and roofed over, becoming transformed into covered porches.

Another monastery plan, made some 250 years later, represents Canterbury. It seems to have been designed chiefly to show the system of water-

works; but there is some indication of the gardens. The herbarium (herb garden) evidently occupies part of one of the cloisters. The vineyard and orchard are next to the grainfields outside the walls.

Besides all such gardens it was customary for the abbot to have a private garden, as the bishop still does in the cathedral close of Exeter. This would presumably be a pleasure garden for his private recreation.

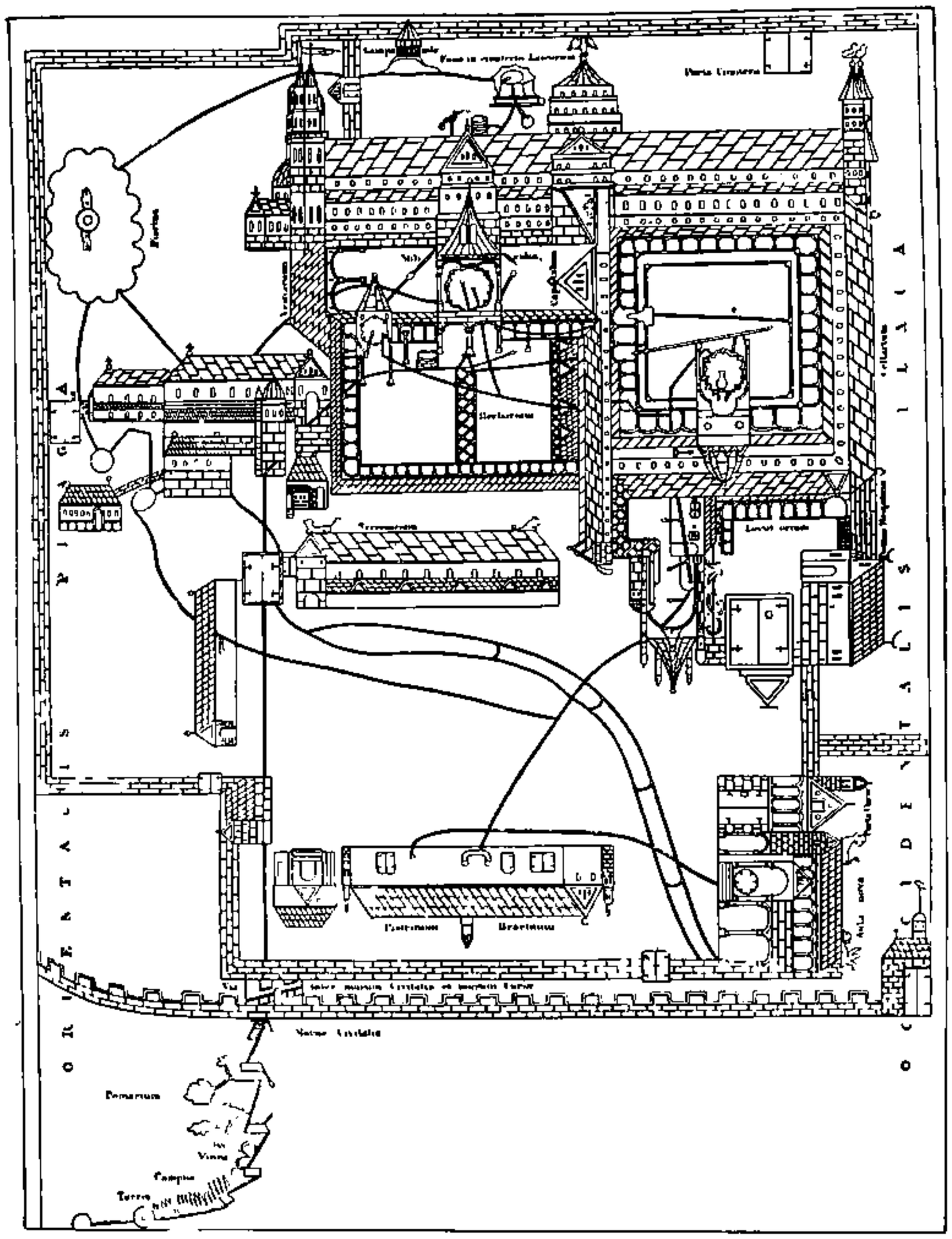
It is told of William Rufus that, having forced his unwanted and headstrong presence into the convent of Romsey, where a royal young lady was being educated, he passed into the garden as if to "see the roses, and other flowering herbs,"[3] and thence departed in peace. Nothing could better testify to the presence in monasteries of gardens devoted to the beauty of flowers, nor to the effect of them upon the human spirit.

A charming picture of the monastic garden has survived in the poem entitled *Hortulus*—The Little Garden—by Walafrid Strabo, who was abbot at Reichenau near St. Gall. It is a poem of 445 lines, written in Latin. The Praefatio opens with the words: "Since many things are the adornments of a quiet life . . " and gives directions for the laying out and care of a garden. Much of this does not sound alien to our ears.

"The gardener must not be slothful but full of zeal continuously, nor must he despise hardening his hands with toil." "When last winter had passed and spring renewed the face of the earth, when the days grew longer and milder, when flowers and herbs were stirred by the west wind, when green leaves clothed the trees, then my little plot was overgrown with nettles. What was I to do? Deep down the roots were matted and linked and riveted like basket-work or the wattled hurdles of the fold. I prepare to attack, armed with 'the tooth of Saturn,' tear up the clods and rend them from the clinging network of nettle roots . . . I plant my seeds and the kindly dew moistens them. Should drought prevail, I must water it, letting the drops fall through my fingers, for the impetus of a full stream from the water-pot would disturb my seedlings. Part of my garden is hard and dry under the shadow of a roof; in another part a high brick wall robs it of air and sun. Even here something will at last succeed"![4]

Then come 23 sections which characterize as many plants, among which we note salvia, also rue with its "blue-green leaves and short-stemmed flowers, so placed that the sun and air can reach all its parts, great is its power over evil odours." "Horehound is bitter to the palate yet its scent is sweet. Drink horehound hot from the fire if you are poisoned by your stepmother." Of roses and lilies, "better and sweeter are they than all the other plants and rightly called the flower of flowers . . . roses and lilies for our church, one for the martyr's blood, the other for the symbol in His hand. Pluck them, O maiden, roses for war and lilies for peace, and think of that Flower of the stem of Jesse. Lilies His words were and the hallowed acts of His pleasant life, but His death re-dyed the roses."[5] He concludes with a dedication addressed to the Abbot Grimwald, who had been his teacher. "If you are sitting in the precincts in your

[3] Rohde, E. S. op cit. p. 32.
[4] Rohde, E. S. op cit. p. 30.
[5] Rohde, E. S. op cit. pp. 30-1.



A plan for the waterworks of Canterbury Cathedral in England around 1100, showing parts of the abbey, cloisters, and gardens.

green garden, under your shady apple-tree with its swelling fruits, where the peach-tree parts its foliage to cast a dappled shade, while the young lads from your happy school gather the gray downy fruit, then read my gift . . . "[6]

[6] Gothein, Marie Louise. *A History of Garden Art.* p. 180.

It is curious how few of the old writers mention weeds, and we may notice that, just as our worst weeds today are those introduced from the old countries, so the young monk's abhorred nettles had been introduced as a result of the Roman conquest of Europe.

We turn from poetic pictures of the joys of the garden to more mundane considerations. Many detailed records exist of the operations of the monastic gardens and their incomes and expenses. In 1170 at Ramsey Abbey there were two famuli working under the hortulanus, each paid 14 loaves and 2 acres of land. A list of expenses of the year 1340 mentions wages of servants, pensions, flowers for feasts, mowing, seeding, weeding; iron spades, forks, a scythe, and other implements; mending axes and sharpening tools. Receipts included rents of land, sale of vegetables and of cattle. The receipts often did not equal expenses, but of course much of the produce was absorbed in the daily life of the Abbey. And who has ever been able to measure the profits of a pleasure garden?

(*To be continued*)

Mrs. Carl A. de Gersdorff

AFTER an illness of only a few days, Mrs. Helen Suzette de Gersdorff, one of the staunchest friends and most faithful workers in the interest of the New York Botanical Garden, died at her home, 635 Park Avenue, June 13, at the age of 72. She was the wife of the celebrated New York lawyer, Carl A. de Gersdorff.

The former Helen Crowninshield, Mrs. de Gersdorff was the daughter of the late Frederic Crowninshield, muralist, designer, and director of the American Academy at Rome. Born in Paris and spending her early life abroad, Mrs. de Gersdorff came to this country in 1882, moving to New York City in September 1895, after her marriage. She was well known to lovers of gardens for her active work in garden clubs and flower shows, in which she was usually a successful exhibitor. Her talent for flower arrangements she is said to have inherited from her father.

Mrs. de Gersdorff held prominent offices in the Garden Club of America, the Berkshire Garden Centre, and the Lenox Garden Club of Lenox, Mass. She had been a sustaining member of the New York Botanical Garden since 1924, a member of the Advisory Council since April 1926, and of the Corporation since January 12, 1931. She had been a vice-chairman of the Advisory Council since 1932.

Besides her garden activities, Mrs. de Gersdorff was interested in the advancement of art, and the awarding of the three Crowninshield prizes, which she presented each year in memory of her father, for sculpture, painting, and water-color, was an important feature of the annual Stockbridge Art Exhibit. By donations both of money and of her untiring services she aided various charities, girls' clubs and hospitals. For more than forty years she was a member of the governing committee of the New York Exchange for Woman's Work.

Funeral services were held from St. Paul's Episcopal Church, Stockbridge, Mass., June 16.

Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Conifers Listed

SELECTION OF NARROW-LEAVED CONIFEROUS EVERGREENS. L C. Chadwick. 64 pages, indexed. Second series. American Nurseryman, Chicago, 1940. 40c.

The author of this handbook on evergreens would limit the use of conifers in the northeastern United States to the kinds here specified by him, permitting only minor substitutions to suit climatic extremes, but allowing no additions. We are apparently to yield up the delights of diversity and choice, and, from Dan to Beersheba, plant standard assortments picked for high regional ratings rather than local excellence.

Here is an attempt to turn mere lists of names to uses which, in the present state of plant-naming, they cannot serve. If, for example, one were to obtain by name from scattered sources an assortment of the low junipers listed, the discrepancies in the labels would demonstrate at once the meaninglessness of these names for practical purposes. They have hardly any currency value, and any paper issued against them is like a rubber check.

It would not be easy to name such an assortment properly, on any sound basis. Very few people could do it. Could the author? The difficulty is appalling. One uses gratefully what guidance is available in handbooks, aware that it represents sometimes only the best possible digests of unsatisfactory basic data. If one would make so much more positive and judicatory a use of these names than, for instance, Bailey and Rehder intend, one ought to be extraordinarily well prepared.

The idiom of this little book is not that of the student, but rather that of the unschooled in matters of plant identity. One doubts that there is any such thing as the best ten or twenty plants in any group or category. To impose one's mere preferences by way of general standard—and that on no firmer basis of evaluation than is here presented—is presumption of a most unfortunate kind.

Space does not permit detailed criticism of height-groupings and evaluations. For judgment *in absentia,* see page 8: "Plants to discard . include some . . . which have not been sufficiently tested, but are placed here because of their similarity, at least in description, to others in the list."

The remarks on nomenclature are inept, the use of names in many instances questionable. Ambitious in scope, cock-sure in manner, this big little book bespeaks all manner of inaptitudes for critical dissertations on plant materials for the northeastern United States.

For the uncritical, the name of Ohio State University on the title page will seem to lend worth and weight. To the critical, it will convey other significance.

P. J. VAN MELLE.

Nature Study For The Young

REVISED HANDBOOK FOR BOYS. 680 pages, illustrated, indexed. Boy Scouts of America, New York. First edition, 33rd printing. 1940. 50c.

GIRL SCOUT HANDBOOK. 694 pages, illustrated, indexed. Girl Scouts, Inc., New York, 1940. 50c.

BOOK OF THE CAMP FIRE GIRLS. 274 pages, illustrated, indexed. Camp Fire Girls, Inc., New York. Second printing, 1938. 50c.

The amount of information crowded into these three handbooks is amazing. Too much cannot possibly be said in praise of the work of the Boy Scouts, Girl Scouts, and Camp Fire Girls whose handbooks these are. As long as any large proportion of the boys and girls of our land is guided by books like these, we need have no fears for the future of America.

Of the Boy Scout handbook, in its various editions and printings since 1910, 6,900,000 copies have been distributed. The present printing contains numerous changes; the botanical portion, written by George T. Hastings, has been revised. There are sections on the identification of farm crops, on tree repair and sur-

gery, on grafting. Dr. Sudworth and the U. S. Forest Service have contributed a section describing 126 American trees, with illustrations of their growth, leaves, fruits, flowers, winter twigs, and bark, and maps showing their geographic distribution. The requirements for a merit badge in botany have been considerably modified.

The Girl Scouts, too, are well taught the parts of a flower, kinds of leaves and buds, gardening, and the identification of wild flowers, trees, and garden flowers.

In their list of "A thousand and more things to do" the Camp Fire Girls are given 44 problems with wild flowers and grasses, 38 with trees, shrubs, and woody vines, 50 in gardening, and 17 with ferns, fern allies, mosses, lichens, and fungi.

H. N. MOLDENKE.

Of Interest to Scientists

THE UPPER TRIASSIC FLORA OF ARIZONA. Lyman H. Daugherty. 108 pages, illustrated, indexed. Carnegie Institution of Washington, Publication 526, Washington, D. C., 1941. $1.25 in paper cover, $1.75 in cloth binding.

A varityped book, done by the offset process and well illustrated, with a section on the geologic occurrence of the flora concerned contributed by Howard R. Stagner of the Petrified Forest National Monument.

THE FLORA OF WHATCOM COUNTY, State of Washington. Vascular Plants. W. C. Muenscher 139 pages, 10 illustrations, index. Published by the author, Ithaca, N. Y., 1941. $1.25.

The result of more than 30 years of exploration west of the Cascades during which more than 10,000 sheets of herbarium specimens were gathered, one set of which is at the New York Botanical Garden. In addition to the annotated catalog of the vascular plants of the region, occupying 86 pages of the text, there are sections on the county's nine botanical regions, on native ornamental plants, weeds, poisonous plants, and other subjects, including botanical explorations there since 1851.

FRENCH-ENGLISH SCIENCE DICTIONARY. Louis De Vries 546 pages McGraw-Hill, New York, 1940. $3.50

The clear type and fine printing add to the usefulness of this ample dictionary of 43,000 scientific terms for English-speaking people who are reading in French.

HUNGER SIGNS IN CROPS. Gove Hambidge and others. 327 pages, illustrated and indexed. The American Society of Agronomy and The National Fertilizer Association, Washington, D. C., 1941. $2.50.

Sixteen agricultural scientists have contributed to a symposium on plant nutrition and deficiency diseases. Many colored photographs help to tell the story of what happens to plants when calcium, potassium, or other chemicals are lacking in the soil.

RUBBER AND ITS USES. Harry L. Fisher. 128 pages, illustrated and indexed. Chemical Publishing Co., Brooklyn, 1941. $2.25.

A practical book for the manufacturer, with ample references to stimulate further study.

BOTANY OF THE CANADIAN EASTERN ARCTIC. Part I. Pteridophyta and Spermatophyta. Nicholas Polunin. 408 pages, map in pocket. National Museum of Canada, Ottawa, 1940. $1.

A detailed account of the taxonomy, systematic position, and morphological variation of each of the 399 species and delimitable varieties and forms of vascular plants which have so far been found growing north of the 60th parallel of latitude in eastern Canada; also significant features of their distribution and ecology.

Home Owner's Guide to Pruning

PRUNING TREES AND SHRUBS. Ephraim Porter Felt. 200 pages, illustrated with photographs, indexed. Orange Judd Publishing Co., New York, 1941. $2.

Here is a profusely illustrated book describing the pruning and training of shrubs and vines grown for ornamental and fruit-producing purposes. It will be found especially useful to the home owner as a guide in growing more vigorous and shapely woody plants.

While technical details have in general been avoided, explanations are given for a few pruning operations that can only be performed by the trained specialist.

RALPH PINKUS,
Arboretum Foreman.

Current Literature At a Glance*

Chrysanthemum. In a reprint received from T. Nakai, Director of the Botanical Institute and the Botanical Gardens of Tokyo Imperial University, the true *Chrysanthemum coreanum* is mentioned as being near to *C. sibiricum alpinum.* "Yet it is distinguishable," the author says, "with its stunted stem with subradically congested fleshy shining glabrous leaves and 1-2 peduncled large flowers." The plant that is known in the American horticultural trade as *C. coreanum* is given as another variety of *C. sibiricum.*

Soybeans. Nearly fifty uses have been found for soybeans since their culture was begun in the United States, according to a table presented by Lee H. Landis in the Nov. 1 number of *Seed World.* The plants themselves make green manure and forage of various types, while the seeds in the form of oil, meal, or beans either green or dried are made into many commercial products ranging from soap to explosives, into infant food, fertilizer, cheese, a coffee substitute, and are used in many forms as a main dish for the dinner table.

Weeds Again. Michigan's weeds are presented with descriptions, pictures, a key, and instructions on chemical and other types of control in Special Bulletin 304 of the Agricultural Experiment Station. Henry T. Darlington, Ernst A. Bessey, and Clive R. Megee are the authors of this 216-page publication.

Growth Substance. The effect of Hormodin A on the rooting of cuttings is told in Research Bulletin 280 of the Iowa Agricultural Experiment Station. Herbaceous, greenwood, evergreen, and hardwood cuttings were tested by the authors, Marcus A. Maxon, B. S. Pickett, and H. W. Richey.

Cascara. In the January number of *Forest* and *Outdoors* (Montreal) is told the story of how the western Canadians gather cascara for the drug trade by stripping the bark from trees of *Rhamnus Purshiana* in the spring.

* All publications mentioned here—and many others—may be found in the Library of the Botanical Garden, in the Museum Building.

Century-mark. The Jan. 2 issue of the *Gardeners' Chronicle* marks the one-hundredth anniversary of this worthy British horticultural publication, of which Charles H. Curtis has been editor for the past 23 years. Among its founders in 1841 were John Lindley and Joseph Paxton.

Orchids. Culture of orchids is the subject of an 8-page leaflet recently issued by the U.S.D.A. Cultural notes are also given in the American Orchid Society Bulletin, in the February number of which Louis O. Williams encourages the growing of Cymbidiums.

Notes, News, and Comment

Visitors. Mrs. Inez M. Haring, bryologist, of Poughkeepsie, who is well known as a student of the mosses of North America, has been spending a month at the Garden examining the collection in the Elizabeth Gertrude Britton Moss Herbarium.

Dr. R. R. Stewart, Principal of Gordon College, Rawalpindi, India, has returned to America for his sabbatical leave, bringing with him a large number of botanical specimens collected in Kashmir and the foothills of the Himalaya Mountains. He plans to spend most of his time studying the plants in the Oriental Herbarium. This is the fourth time that Dr. Stewart has spent a year at the Garden.

Dr. César Vargas C., Professor of Botany at the University of Cuzco, spent a short time at the Garden in June in research on the genera *Bomarea* and *Stenomesson.* Dr. Vargas has completed one year of research at the University of California as a Fellow of the Institute of Cultural Relations. He is returning to Peru in July.

Mr. J. E. Nielsen, President of the State Microscopical Society of Illinois, studied the diatom collections at the New York Botanical Garden June 23 and 24. During the past year Mr. Joseph F. Burke has worked with Mr. Nielsen on some of the type species of diatoms which are deposited with the Microscopical Society.

Other visitors to the Garden recently have included Dr. Matilda Bensaude, former head of the Department of Plant Pathology for the Portuguese govern-

ment; Richard Evans Schultes of the Harvard Botanical Museum, and Mr. M. McDonald, Professor of Biology, Parsons College, Fairfield, Iowa.

George Blumenthal. In the death on June 26 of Mr. George Blumenthal, the New York Botanical Garden loses a man who has given long years of service to the institution. Mr. Blumenthal had been a member of the Corporation since January 1914.

Blueberries. Dr. W. H. Camp spent the week of June 17-24 in Maine studying the genetic and ecological successions of the commercial low-bush types of blueberries, also the high-bush types which might be useful in cultivation. On Mt. Katahdin he also investigated the non-commercial alpine species. He was accompanied by Dr. F. B. Chandler of the Maine Agricultural Experimental Station and Prof. A. H. Steinmetz and F. Hyland of the University of Maine. On June 24 at Durham, N. H., he led the round-table discussion on the floras of northeastern North America at the joint summer meeting of the American Society of Plant Taxonomists and the Botanical Society of America.

Grapes. Dr. A. B. Stout was at the New York State Experiment Station at Geneva, N. Y., June 15-28 for further work in breeding for hardy seedless grapes. During this period he attended a round-table conference and participated in the reports held at Geneva of about 30 horticulturists from the eastern and northern states on the breeding of tree fruits and grapes. He was also at Geneva June 27 and 28 for the Lily Field Day held by the Lily Committee of the American Horticultural Society.

Groups. Nine groups under special guidance, totaling approximately 230 people, visited the hardy waterlilies, perennials, irises, and the Rose Garden, Rock Garden, and the Main Conservatories during the last of May and early June. They included students from public schools in the Bronx, North Haledon, N. J., Union City, N. J., and Long Island City, besides the Department of Landscape Architecture at Columbia University, in addition to a group of Girl Scouts from Mamaroneck, the Luther Burbank Garden Club, and the Garden Club of Morristown, N. J.

Initiation. Dr. J. H. Barnhart was initiated into Phi Beta Kappa on June 13. He had been voted a graduate member last year by the branch at Wesleyan University, Middletown, Conn., where he received his degree in 1892.

Student Gardeners. Robert Weidner, gardener and former student gardener, left the Garden June 15 to take a position as plant propagator at the Del Amo Nurseries, Compton, Calif. Robert Simpson left June 30 for "Peacock Point," Locust Valley, Long Island, to become assistant gardener on the estate of Mrs. H. P. Davison.

Staff Member. John H. Pierce, who took his Master's degree last year at the University of Michigan, has been appointed Technical Assistant at the New York Botanical Garden, to work in the Britton Herbarium. Mr. Pierce completed his Bachelor's degree at Clark University in 1936. He assumed his new duties July 1.

Reunion. On a brief trip recently Dr. F. J. Seaver attended commencement exercises at Morningside College, Sioux City, Iowa, and joined a reunion of the former biology students of the college. During his visit he lectured on his latest trip to Bermuda.

Lectures. Staff members who have given lectures recently include E. J. Alexander on "Wild Flowers," June 9, to the Flushing Garden Club, and T. H. Everett on "Dirt Gardening" before the Garden Club of Darien, Conn., June 18, and the Westport Garden Club July 11.

For Young People. A corner has been reserved in the library for juvenile readers, in response to many requests. The spot will be of interest to teen-age boys and girls, containing such books as Scout and Camp Fire Manuals, the Zoo bulletin, and various popular nature books.

Rock Gardeners. Mrs. Mortimer J. Fox of Peekskill, a member of the Corporation and of the Advisory Council, was elected Second Vice-president of the American Rock Garden Society at the annual meeting held in April. The three directors for this year are A. C. Pfander of the New York Botanical Garden, James G. Esson of Great Neck, Instructor for the Botanical Garden, and Ira N. Gabrielson, Director of Fish and Wild Life Service, U.S.D.I.

THE NEW YORK BOTANICAL GARDEN

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by descriptions.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays, programs, lectures, and other events at the Garden.

(5) Credit to the amount of the membership fee paid, toward courses of study offered by the Garden.

(6) The privilege of borrowing lantern slides from the Garden's collection.

(7) Use of the Members' Room in the Museum Building.

A limited number of garden clubs are accepted as Affiliates. The privileges of affiliation are one lecture a year by a member of the staff, a share in the distribution of plants when they are available, a subscription to the Journal and to Addisonia, and announcements of special activities at the Botanical Garden. In addition, any member of an affiliated club may enroll for one subject each year in a study course for one-half the regular fee. Beginning January 1, 1942, this regulation will read: "Any member of an affiliated club may receive for the current year of membership a reduction of $5 in the fees paid for instruction. This does not apply to the course for professional gardeners." An Affiliate Garden Club may borrow lantern slides from the Garden's extensive collection, such loan being subject to the regulations for the use of lantern slides by individual members. Likewise, an affiliate club may engage without fee the Members' Room at the Garden for its meetings.

The classes of membership are as follows:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Affiliation	annual fee for club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

Contributions to the Garden may be deducted from taxable incomes. The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————————.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

August 1941

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A MESSAGE FROM ENGLAND

"MAN was lost and found in a garden!" In a garden may be found both rest and refreshment to soul and body and also inspiration with opportunities for reflection and research.

This applies to the humblest plot as well as to the botanic garden, and much may be learnt from a careful study of the development of the commonest weed. In the botanic garden where "Every tree that is pleasant to the sight and good for food" may be grown, as well as those of service to mankind, as the source of drugs, spices, beverages, fibres, timbers and suchlike, the educational possibilities and openings for research are far greater.

The search for plants yielding drugs and spices led to the foundation of botanic gardens; for in the monastic gardens of the middle ages—the forerunners of the botanic gardens attached to the universities—the cultivation of "simples" was one of the chief concerns of the community. Interesting survivals of these early physic gardens may still be seen in the Botanic Garden at Padua, and the Apothecaries' Garden at Chelsea—the Chelsea Physic Garden.

The search for spices has caused men to travel far and wide over the surface of the earth, has destroyed monopolies in the trade in economic products derived from plants (cloves, nutmegs, cinnamon, etc.), and has led to the establishment of gardens for their cultivation and exploitation. In this way many of the tropical botanic gardens have come into being, and through their efforts new markets have been opened for the drugs, spices, and other economic products, native to one particular locality and under the control of one nation.

Botanic gardens, wherever they may be situated, should be the Mecca to which we turn for correct identifications of plants of economic value. They should also be a source of supply, both of economic and decorative plants, to other gardens or countries for the general good of mankind. Would that in these anxious days we could find and distribute that tree "whose leaves were for the healing of the Nations"!

Director, Royal Botanic Gardens, Kew

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The Soybean

By W. M. Porterfield

(No. 10 of a series of articles on Chinese Vegetable Foods in New York.)

IN more ways than one the roots of antiquity are buried deep within our midst even here in this modern city of New York. Besides the ginkgo tree of which we have spoken, and the bamboo whose shoots in these columns have passed in review, we now come to the soybean whose name, Shu, appears on the honor roll of the ancient Chinese classics. We see it now, not as an historical relic clothed in the aura of past glories, but filling the commonplace role it always has, in Chinatown as in far-away China—namely, that of feeding hungry palates, and appearing in the same guise in which it was sold on the ancient streets of old Peking.

4,900 Years in Cultivation

The soy bean, *Glycine Max** has been a familiar Chinese cultivated plant since the twenty-ninth century B. C. and is supposed by some authorities to be derived from *Glycine ussuricnsis*[1], which grows wild in eastern Asia. In New York the soy bean is sold in the Chinese shops mainly in three forms: as seed, bean sprouts and bean curd. Soy sauce and soy bean oil can also be obtained. While the seed, the sprouts, and the bean curd (a kind of cheese) are eaten in various forms as food, soy sauce is a heavy dark fluid which is used as a condiment to supply the

* Called by various authorities *Glycine Soja*, *G. hispida*, and *Soja Max*. The common name of soy bean, soy-bean, or soybean, also has its variants, according to different authorities. The practice of the United States Department of Agriculture is to combine the two words into one. The same style is also given by Webster's New International Dictionary, second edition (1935). It is therefore used in the title of this article and in the opening paragraph, but the style of two separate words, which had been set in type some 87 times in the eight pages of this article, has not been changed.—C.H.W.

[1] Morse, W. J. Soybeans: Culture and varieties. U.S.D.A., Farmer's Bulletin No. 1520. p.1. 1939.

saltiness that brings out flavor, and soy bean oil is used in cooking like other oil or butter, and also for lighting lamps. In the Chinese shops bean curd, or Tou-fou, is kept in empty kerosene tins under water.

In these, its usual forms, we meet the soy bean but they by no means complete the story. Of all the Leguminosae, the soy bean is the most useful plant and has been so since the dawn of writing in China. In the following pages I shall present a few of the interesting facts about soy beans which will show both the versatility of the beans themselves and the far-reaching importance of their cultivation.

It is not the purpose of this paper to present a systematic description of the soy bean plant and its varieties or to furnish detailed instructions on its cultivation. These are readily available in Government publications, scientific journals, and books devoted to the subject. The aim is rather to describe in brief the history, chemical and nutritional content, and uses of this remarkable plant product.

Legend and Literature

The name Shu[2] occurs in the Shi-king, or Book of Odes, written before the third century B. C. The Kuang-ya written by Chang-yi in the Tsin Dynasty, 265-420 A. D., determined the identity of "Shu" with Ta-tou (great bean). The Pen-ts'ao-king-mu, the celebrated *materia medica* of Li Shi-chen, completed near the close of the sixteenth century, distinguished three kinds of Ta-tou—a black, a white and a yellow. According to ancient ritual,[2] at the vernal equinox the ceremony of ploughing the soil and sowing of the five kinds of grain were performed by the Emperor assisted by the members of the boards. One of the five "grains" was supposed to have been the soy bean.

Since those days people have continued to exploit the soy bean. Not only has it been to the Chinese "the poor man's meat and the poor man's milk," according to an ancient Chinese proverb, but it has also been elaborated upon and dished up in more than 400 tasty ways by Chinese housewives. As its fame spread gradually around the world it developed more and more uses. The greater demand for it in this country has boosted cultivation until, according to a recent estimate, our Federal Government predicts a record crop of 110,000,000 bushels of soy beans this year.

Kaempfer[3], writing in 1712, is supposed to have been the first European to have described the soy bean plant. Henry[4] comments on it as a staple

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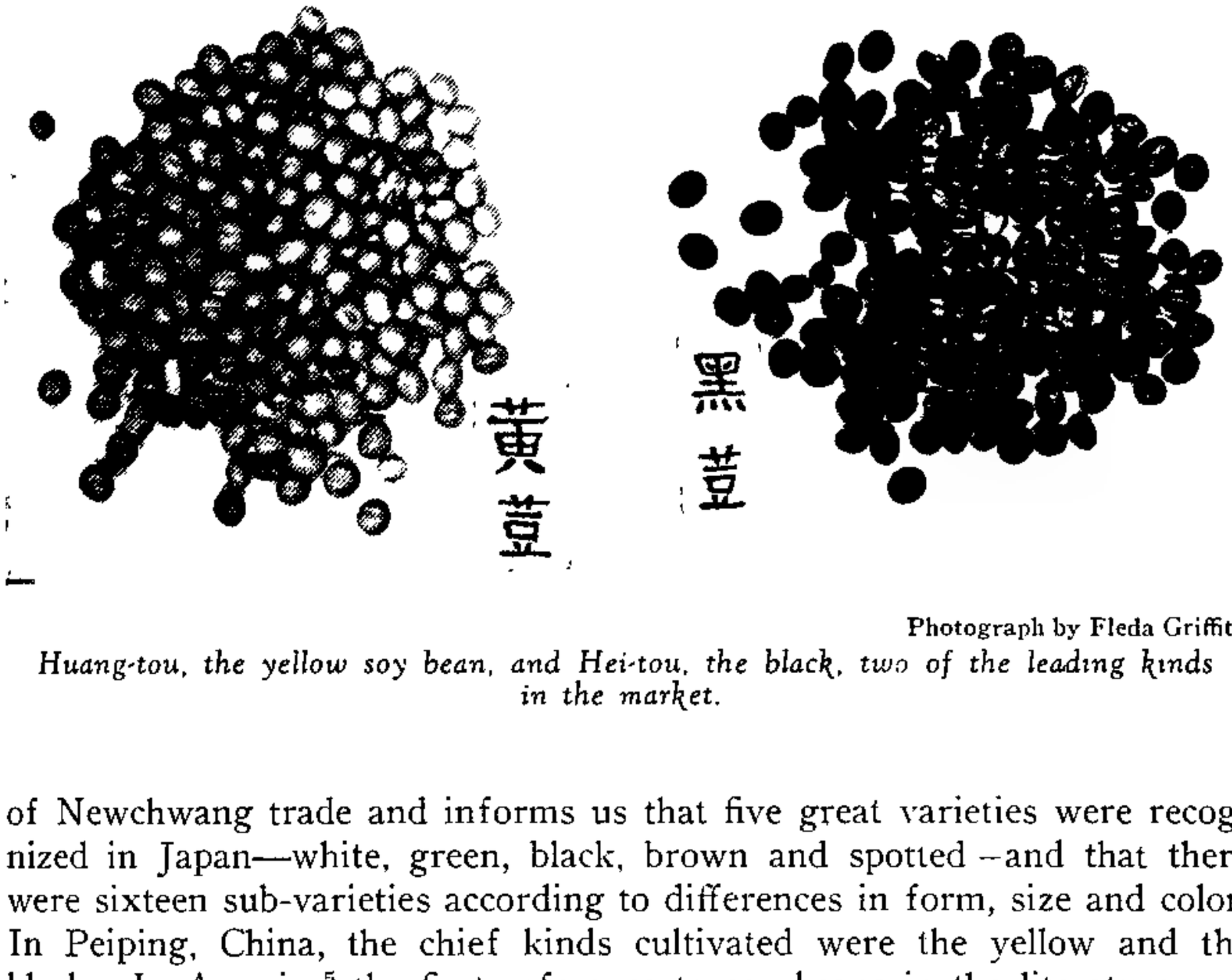
[2] Bretschneider, E. On the study and value of Chinese botanical works, with notes on the history of plants and geographical botany from Chinese sources. pp. 7, 9. 1870.

[3] Blasdale, W. C. A description of some Chinese vegetable food materials. U.S.D.A., O.E.S., Bul. 68, p. 32. 1899. Also:
Bretschneider, E. in loc. cit. p. 9, footnote. 1870.

[4] Henry, A. Notes on economic botany of China. pp. 13-14. 1893.



Photograph by Fleda Griffith

Huang-tou, the yellow soy bean, and Hei-tou, the black, two of the leading kinds in the market.

of Newchwang trade and informs us that five great varieties were recognized in Japan—white, green, black, brown and spotted –and that there were sixteen sub-varieties according to differences in form, size and color. In Peiping, China, the chief kinds cultivated were the yellow and the black. In America[5] the first reference to soy beans in the literature was made by James Mease in 1804. Up to 1898 only eight varieties were grown in the United States but now, out of 2,500 known types, 100 named varieties are handled by domestic growers and are the objects of much investigation by the Government's Agricultural Experiment Stations.

The Soybean Market

Prior to 1908 the trade in soy beans was confined to China, Manchuria and Japan. From that year, because of the Russo-Japanese war, soy beans began to be shipped to England[6]. In 1908, 2,000 tons were shipped to England; in 1928, 1,000,000 tons were handled in the London market alone and their import into Germany amounted to nearly 850,000 tons. Imports into the United States for 1928[7] were: for beans, 4,255,734 pounds at a value of $154,579; for soy bean cake, 96,810,135 pounds valued at $1,920,021; and for soy bean oil, 13,116,220 pounds at a value of $823,619. From 1929 to 1938 acreage in the United States put out in

[5] Morse, W. J. in loc. cit. pp. 3, 5-6. 1939.
[6] Du Toit, F. M. Soy beans in the Union. Dept. of Agric. Bul. 107. p. 16. 1932.
[7] Morse, W. J. Soybean utilization. U.S.D.A., Farmer's Bulletin No. 1617. p. 11. 1932.

soy bean crops has steadily increased: 2,736,000 acres in 1929 to 7,789,000 acres in 1938, when 57,665,000 bushels of seed were produced, about 85 per cent of it in Illinois, Indiana, Iowa, Missouri, and Ohio.

While the soy bean plant is sensitive to frost, it exhibits much varietal adaptation, including relative time of maturing, which makes it possible for the grower to select varieties for different purposes in different climates. In any region where corn will grow, soy beans will also grow; in fact, in both the United States and Japan soy beans are planted with corn with profitable results. Soy beans are also grown with sorghum and millet. Similarly, they have been listed among the plants tested at Bambesa and found suitable for use as a green manure for cotton growing in the Belgian Congo[8] The reason for this is that the roots of the soy bean produce nodules caused by bacteria which trap the nitrogen from the air and fix it in a form useful to other plants. Upon decomposition nitrogen is restored to the soil, but first of all the proper nodule-forming bacteria must be there. Often when soy beans are grown for the first time in a region, the specific bacteria must be artificially introduced into the soil. According to Burrill and Hansen[9], the bacteria which produce nodules on the roots of lucerne or cowpeas are not suitable for soy bean plants. It is the property of nitrogen-fixation that makes this plant useful as a green manure crop and causes other plants like corn to grow better when associated closely with it.

What the Beans Contain

One analysis[10] of soy beans gives the following results:

Moisture	8.88%	Fiber	5.20%
Protein	42.2	Carbohydrate	26.13
True proteids	31.28	Ash	4.23
Fat	13.36	Starch	small quantities

According to another authority[11] the proximate average percentages of constituents making up the composition of soy beans are:

Moisture	8.0%	Fiber	3.5%
Ash	4.6	Pentosan	4.4
Fat	18.0	Sugars	7.0
Protein	40.0	Starch-like substances	5.6

The former analysis is that of the Ogemaw soy bean inoculated with the correct bacteria and tested at the Michigan Agricultural Experiment

[8] Robyns, Walter. Plantes congolaises pour engrais verts et pour couverture. Bul. Agricole du Congo Belge. 1929.

[9] Burrill, T. J. and Hansen, R. Is symbiosis possible between legume bacteria and non-legume plants? Ill. Agric. Exp. Sta. Bul. 202. 1917.

[10] Du Toit, F. M. in loc. cit. p. 12, 1932.

[11] Jones, D. B. Soy beans—their food value. Bureau of Chemistry and Soils, U.S.D.A., MC-28, p. 1. April 1938.

Station. In the seeds from a plant not inoculated the protein content of the same variety is only 35.39 percent and the true proteids 22.69 percent, or 8.59 percent less. It is estimated that the soy bean crop with nodules contained 113.5 pounds of nitrogen to the acre as compared with 75.98 pounds from that without nodules. Additional nitrogen is present also in the leaves and stems of plants provided with nodules, according to the findings of the Cedara School of Agriculture (Annual Report for 1922). The nitrogen content of plants provided with nodules is 2.78 percent, that of plants without nodules only 1.77 percent. This fact is important when considering soy beans for hay or forage.

Soy bean hay has a higher total of digestible nutrients[12] than lucerne (alfalfa), red clover, or oaten hay; 53.6 percent over 51.6, 50.9, and 46.4 percent respectively. It contains 11.7 percent digestible crude protein over 10.6 percent for lucerne hay and less for the others.

Already it is apparent that the humble Chinese soy bean is very useful from a food standpoint because of its high protein content. Not only do the seeds provide good food, but the germinated seeds, known in the markets as bean sprouts, provide a most palatable vegetable when cooked and served as a side-dish at dinner. These have become so popular that they are now canned and sold in American grocery shops. The mung bean (*Phascolus Mungo*) is also a favorite source of bean sprouts. Of the two the soy bean is much larger and thus the sprouts may be distinguished. In the form of bean cheese, or curd, (Tou-fou), the soy bean is also eaten and can be bought in Chinatown at almost every food shop. To make it[13] soy beans are soaked in water three hours, reduced to a paste, then cooked. After being strained through a coarse cloth, the milky white filtrate, rich in protein and fat, is treated with crude salt (magnesium chloride). The proteid material is precipitated and the coagulated mass is pressed and kneaded into small cakes. The cakes may be dipped for a few moments into a saline solution of curcuma. A filtrate from cooked soy beans resembles milk and is known as soy bean milk. When heated, a skin such as forms on milk rises to the surface. For many purposes it can be successfully substituted for cow's milk.

An analysis of four food products of soy bean is herewith given:

	Water	Protein	Fat	Carbo-hydrates	Undeter-mined
Bean cheese (Tou-fou)	76.15%	13.15%	7.09%	1.40%	—
Soy bean milk	93.10	3.13	1.89	0.51	—
Bean oil (Tao yu)	57.12	7.49	—	18.76	—
Soy sauce (Tao jung)	62.85	12.67	1.21	6.71	2.77%

[12] Wenholz, H. Soy Beans—A New Farm Crop. The Agric. Gaz. of New South Wales. **37 (12)**: 915-920. Dec. 1, 1926.

[13] Blasdale, W. C. A description of some Chinese vegetable food materials. U.S.D.A., O.E.S. Bul. 68, p. 32. 1899.

The nutritional merits of the soy bean are made evident in some figures found in a Chinese study of several important food plants[14] The biological values for the proteins of mung bean, peanut, and soy bean curd turned out to 58, 59 and 65 respectively. The coefficients of digestibility of mung bean, peanut, and soy bean curd are 86, 95 and 96 respectively.

The yellow soy bean when analyzed for mineral content[15] showed 0.49 percent aluminum as aluminum oxide, about the same of iron as iron oxide, 7.45 percent calcium as calcium oxide, and 7.34 percent magnesium calculated as magnesium oxide. Soy bean sprouts, germinated in Peking hydrant water, showed 0.43 percent, 10.96 percent, and 8.63 percent for the same minerals respectively.

Photograph by courtesy of the Bureau of Plant Industry, U S.D.A.
A field of soy beans, part of America's $45,000,000 *annual crop.*

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[14] Pian, Juna Hsueh-Chin. Biological value of the proteins of mung bean, peanut and bean curd. Chin. Journ. Physiol. **4** (**4**) : 431-436. Nov. 1930.

[15] Sherman, H. E. and Wang, T. C. Calcium, iron and magnesium content of sixteen Chinese foods. Philipp. Journ. Sci. **38** (**1**) : 81-82. Jan. 1929.

According to Jones[16] the mineral composition of air-dried soy beans is:

Ash	5.06%	Magnesium	0.22%
Potassium	1.91	Phosphorus	0.59
Sodium	0.34	Sulphur	0.41
Calcium	0.21	Chlorine	0.024
Iron	0.0074	Manganese	0.0028
Copper	0.0012	Zinc	0.0018

Tests made with Chinese mice[17] have shown both yellow and green soy bean sprouts to be plentiful sources of Vitamin B. In tests with albino rats soy bean curd was also found to have abundant Vitamin B. In other tests[18] soy bean curd proved to possess a fair amount of Vitamin A.

However, a determination of Vitamin C content[19] by the Bessey and King method showed that soy beans contained only a very little in fresh pods. According to the tables of Yueh-fong and Read, soy bean sprouts contain no Vitamin C, but according to Jones[20] the sprouts are "a very good source of this vitamin." Soy beans are said by the same authority to be a good source of Vitamin B_1 and they contain a small amount of Vitamin G. Soy bean oil contains little Vitamin A or Vitamin D.

The fuel value of soy beans per pound is 1,985 calories.

Fertilizer, Food and Fabrics

After the oil has been expressed from soy bean seeds to be used for cooking purposes and for illumination, the residue left is a hard cake which is used in China for fertilizer, also for an animal food. To prepare the fertilizer the disk-like cake is broken up and thrown into a vat of water and allowed to ferment. The stench arising therefrom is terrible.

Crude soy bean oil has another important use. According to Horvath[21] the soap industry of the United States is "the largest single consumer of crude soy bean oil." It is said to give to soap the property of lathering even in a 3.5 percent concentration of salt. Automobile soft soap depends on soy bean oil because it leaves no film on the finish. Both Chinese and foreigners use it along the Pacific for bathing and washing their clothes in the sea water. In the manufacture of soft soap, soy bean oil is superior to linseed oil, and in the manufacture of hard soap hydrogenated soy bean oil is recommended as the best substitute for beef tallow.

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[16] Jones, D. B. in loc. cit. p. 2, 1938.

[17] Sherman, H. E Relative content of water-soluble Vitamin B in thirty oriental foods. Philipp. Journ. Sci. **38** (**1**) : 9-36. Jan. 1929.

[18] Sherman, H. E. Relative Vitamin A content of four oriental foods. Philipp. Journ. Sci. **38** (**1**) : 1-7. Jan. 1929.

[19] Yueh-Fong and Read, B. E. The Vitamin C content of Chinese foods and drugs. Chin. Journ. of Physiol. **9** (**1**) : 47-62. 1935.

[20] Jones, D. B. in loc. cit. pp. 1, 3. 1938.

[21] Horvath, A. A. Soy bean oil for soap making. Journ. Soc. Chem. Ind. **55** (**36**) : 691-693. Sept. 4, 1936.

Other uses of soy beans in the form of flour and meal have been cited. Soy bean flour contains four times as much protein as oat flour, 52.20 to 13.87 percent, and about one-fifth the amount of fat, 1.2 to 6.18 percent[22]. It is asserted that as high as 20 percent of soy bean flour can be used in making bread without changing the flavor, at the same time increasing the protein content from 6 to 12 percent. This bread is said to be good for diabetics. A comparison of cost also demonstrates the fact that the soy bean is one of the cheapest sources of digestible protein. Besides soy bean oil the manufacture of the flour yields another important by product, lecithin. Eggs, the usual source, are much more expensive. Lecithin is commercially important as a fat rich in phosphorus and very useful in the preparation of certain foods and medicines.

Soy bean meal has figured as the basis of two very important developments. It was around 1920 that scientists began to discover the industrial potentialities of the soy bean and now it is the most important vegetable material in industry. The automobile has largely been responsible for this development. It is the source of a widely used plastic and also it is spun into fabrics. This last achievement has been made by the experts in the Ford experimental laboratories at Dearborn, Mich. The protein fiber of soy bean may entirely supplant the cellulose fiber of earlier days, obtained from cotton and wood. Its advantages over other types of fiber are, first, that protein fibers are warmer and retain their shape longer and, second, under controlled conditions the yield of protein fiber from plants will be 100 percent steady in contrast to that of animal protein fiber, which is known to be variable.

For plastics soy bean meal has the required properties. When plasticized it seems to exhibit flow with the moisture content as low as 1 percent[23]. For this reason the plastic does not fracture spontaneously on drying, it holds its shape well, and is almost transparent. The only disadvantage is that plastics made from either soy bean meal or soy bean protein are hygroscopic. Further development is expected in the direction of moldable resinous plastics produced by water resistant plasticizers which would increase thermo-plasticity and at the same time render the substance impervious to water.

Soy bean meal with 9.28 percent moisture content plasticizes when subjected to 100° C. and a pressure of 5,000 pounds per square inch for five minutes. The moisture is reduced to 5 percent by drying in an oven. Further drying brings the moisture content down to 1 percent. Organic solvent dehydration treatment gives the same results. Soy bean plastic

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[22] Du Toit, F. M. in loc. cit. p. 18. 1932.

[23] Beckel, A. C., Brother, G. H. and McKinney, L. L. Protein plastics from soy bean products. Relation of water to plastic properties. Ind. and Eng. Chem. **30** (**4**): 436-440. April 1938.

is a desirable material since it is light, durable, waterproof, fireproof, and does not rot. Many automobile parts, elastic glass, fittings, implement handles and all sorts of miscellaneous articles are made out of it.

There is neither time nor space to detail all the uses of or the various articles made from the soy bean. Glycerin, varnish, billiard balls, notepaper, ink, and paints are only a few of the products into which soy beans go. One has only to study the table of uses appearing in the book by Piper and Morse[24] entitled "The Soy Bean" to realize the extent to which this product has been exploited and put to use. In monetary values the crops of soy beans and the by-products derived therefrom in the United States represent an annual total income of $45,000,000.

Gardens Of Cloister And Castle

As Presented in the Closing Lecture of the Series on Gardens and Plant Lore of Mediaeval Europe Given Through the Collaboration of the Botanical Garden and Metropolitan Museum of Art

By H. W. Rickett

II.

LAY GARDENS of early mediaeval times are lost in even greater obscurity than those of monasteries. Gardens there doubtless were, but probably of a rather rude and temporary character. Agriculture was scarcely in a flourishing state much before 1000 A. D., and the houses even of the chieftains were rather rough affairs surrounded by mounds and stockades for defense. The gardens found in the oldest pictures are small enclosures, a few trees, a bit of turf in which wild flowers flourished, and perhaps a well or spring; the fence was usually of wattle. In many crude sketches an enclosure of wattle stood for a garden, and no attempt was made to represent the plants that grew in it. The horti and hortuli so frequently mentioned in *Domesday Book* must have been gardens of this kind. They might be attached to all sorts of dwellings, from the castle of the noble to the cottage of the serf. They were called *orchards;* not because they were devoted to fruit trees, but because they were fenced places with plants in them (orchard, ort-yard, means plant-enclosure).

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[24] Piper, C. V. and Morse, W. J. The soy bean. McGraw-Hill Book Co. 1923. In addition see: Morse, W. J. Soy bean utilization. U.S.D.A. Farmer's Bulletin, No. 1617. March 1932.

With the increase in power and in pride of the hereditary nobility and the states over which they ruled, their dwellings became castles, strongholds able to stand assault and siege. They were frequently built on the most inaccessible rocks and hills, differing sharply in this way from the monasteries. The earliest of the great stone castles, such as those of the Normans, consisted of a central keep or tower, around which was an open space protected by a fortified wall. Outside this was usually another space and still another ring of fortifications, with moat, drawbridge, and all the rest of the necessary apparatus for keeping visitors at a distance. The keep was the residence of the lord and his family and retainers. In it they occupied rooms of stone strewn with rushes and hung with tapestry, ill-lit by small slits in the massive walls. Life in a modern jail would seem luxurious in comparison. The space between walls and keep was devoted to the soldiers, the blacksmiths, the cooks, the grooms, and all the horses, cattle, and chickens necessary to the household. There was little space for a garden, ornamental or otherwise. Yet if the castle was to fulfill its functions, the walls, which at times might shelter most of the people and cattle of the country, must also protect the gardens, so that those within might have herbs for food and medicine. Accordingly the gardens were taken into the castles, or attached to them by protecting walls. In the process they became considerably compressed. Even so, in pictures of the period it is more frequent to find gardens designed wholly for pleasure than those in which useful herbs predominate. Of such pleasaunces we have innumerable examples in illuminated manuscripts, paintings, carvings, and tapestries.

The castle garden or pleasaunce in its earliest and simplest form was a small enclosure containing turf and perhaps a few trees and a well or fountain. Around the wall often ran a seat, faced with brick (or occasionally boards) and topped with turf. The size and position of this structure suggest that it was originally the archers' walk or fire-step, and might still be used as such if necessary. The turf both on the garden-floor and on the seat was spangled with small flowers, mostly such wildflowers as are represented in the Unicorn Tapestries. The flowery mede was one of the most pleasant features of mediaeval gardens, grateful to several senses.

"Ful gay was al the ground and queynt,
And poudred, as men had it peynt,
With many a fresh and sondry flour,
That casten up ful good savour."[7]

The flowers must have suffered when the seat was used for sitting, as it undoubtedly was. Apparently the turf, both in seats and in lawns, was replaced rather frequently, rather than maintained by the methods we use today. In some pictures of the period the lord and lady sit on the

[7] Rohde, Eleanour Sinclair. *The Story of The Garden*. p. 48.

Romance in a mediaeval garden which is adorned by an ornamental fountain, a pot of carnations, a fancifully clipped tree, and a turf-topped brick seat. From the Roman de Montauban, *in Paris. (Reproduced from Sir Frank Crisp,* Mediaeval Gardens, *Vol. 2, Fig. CCCII)*

lawn in front of the seat; but this is done also in modern gardens. Trellises were often placed against the walls, and over them vines and roses were trained. Arbors also were a favorite means of increasing the pleasure to be gained from a small space.

During the 13th and 14th centuries the emphasis changed in the construction of noble residences; they were still fortified, but no longer built primarily for defense. The massive and gloomy central tower began to disappear, and castles became palaces built around central courts. Gardens, though still small, became more elaborate. The planted area was often enclosed by an ornamental fence, or divided into several gardens by fences and walls. Small trees were clipped into fanciful and formal shapes. Showy flowering plants, particularly carnations, were grown in pots which were set out on the turf. And the fountains offered an opportunity to the skill of the mediaeval designer and sculptor. Such pleasantly sophisticated small gardens, in which the lord and lady might take holiday from their grimmer duties, and in which they often received important guests and envoys, are abundantly illustrated in mediaeval romances. The fabulous garden of the *Romaunt of the Rose* reflects current ideals of gardening.

An exact picture of the gardener's ideals and methods is obtained from the *Opus Ruralium Commodorum* of Petrus Crescentius (first printed in 1471 but probably written in the preceding century). Book VIII treats of

"gardens and pleasant things to be made by art with Trees, Herbs, and Fruit thereof. In the foregoing books trees and herbs were treated according to their existing uses to the human body. Now they will be spoken of according to the pleasures they afford to the mind, consequently preserving the health of the body as the state of the body affects the mind." In the first chapter, entitled "of small gardens of herbs," we read:

"Certain gardens may be made of herbs, some with trees, and yet others of both, when consisting only of herbs they require a poor and solid soil, so that they may produce fine plants which greatly please the sight. It is therefore needful that the place where such a garden is to be made should first be freed from noxious plants and large roots . . . (The soil) must be thoroughly soaked with scalding water, so that the rest of the roots and seeds lying hidden in the ground shall be unable to germinate, and then the whole plot should be filled with fine turf, and the sods themselves thoroughly compressed by wooden mallets and the grass trodden under foot until hardly anything appears, then they will break out little by little and form a green surface . . . Between the level turf and the herbs let there be a higher piece of turf made in the fashion of a seat, suitable for flowers and amenities; . . Care must be taken that the trees are not too thick nor too many in number, which by keeping off air will damage health . . Further, the trees are not to be noxious, such as the walnut and some others, but sweet in flower and pleasant in shade, such as vines, pears, apples, pomegranates, and the like. Behind the turf plot let there be a great diversity of medicinal and aromatic herbs, which not only please by the odour of their scents but by their variety of flowers refresh the sight . . . If possible, a clear fountain should issue in the middle, because its purity produces much pleasantness."

Then comes a chapter on the medium garden, and finally one on gardens of "kings and other illustrious and rich lords." These are extensive, and contain parks with wild creatures, a palace "in which the king or queen may resort when they wish to escape from grave thoughts and to refresh themselves by these joys and solaces;" "hares, stags, roebucks, rabbits and the like harmless beasts;" fish-ponds, shelters of closely woven boughs for pheasants, partridges, and nightingales and all manner of singing birds, and bowers of green trees. The garden palace is to be made of wood, and may be covered with growing vines. Much was made of planting trees so that their interlaced boughs might be fashioned into a living arbor.

"Further, many delights may be secured by inserting curious grafts on diverse trees, which the diligent gardener may easily discover from what is said further in this book." . . . "In such a garden not only will the King delight himself, but sometimes will ease his necessary cares by glorifying God on high, who is the Author and cause of all good pleasure."[8]

This implies the existence of gardens of a very different kind, royal parks like those of Oriental despots in which armies could be reviewed. Charlemagne is reported to have received 1500 men in his garden, and there are similar vague records of other great gardens of Frankish kings. Henry I of England built a palace at Woodstock and made a park 14 miles around, in which he is said to have kept lions, leopards, porcupines, camels, "and strange spotted beasts." Within such royal parks

[8] Crisp, Sir Frank. *Mediaeval Gardens*. Vol. I: 15-18, 1924.

A mediaeval garden as depicted on a Flemish tapestry at the end of the 16th century. Reproduced by courtesy of the Metropolitan Museum of Art.

were doubtless enclosed gardens. The bower and labyrinth connected with the story of Fair Rosamond were at Woodstock. In 1250 Henry III gave orders to have the queen's gardens surrounded by two walls "well built and high with a good herbary in which the same Queen may be able to disport herself; and a gate from the herbary next the chapel of Edward our son, into the aforesaid garden." [9] The herbary was probably an arbor (herber).

The plants grown in mediaeval gardens are set forth in several well known accounts. The earliest and best known is the famous *Capitulare de Villis vel Curtis Imperialibus*, issued in 812. This listed all the well known mediaeval herbs and the few plants grown for their flowers; also fruit trees—apples, pears, plums, medlar, chestnut, hazelnut, almond, mulberry, walnut, cherries. In Necham's *De Naturis Rerum* (ca. 1200) again we find a list of plants for gardens, but since he included oranges, lemons,

9 Rohde, Eleanour Sinclair. *The Story of The Garden*. p. 39.

pomegranates, etc., it is evident that he was compiling from classical sources rather than giving the results of his own practice. His flowers include roses, lilies, peonies, violets, poppies, daffodils; the herbs are parsley, fennel, southernwood, coriander, sage, hyssop, mint, rue, dittany, etc.; pot herbs are beet, orach, sorrel, mallows; fruits medlars, quinces, pears. Bartholomaeus Anglicus wrote a great work entitled *De Proprietatibus Rerum*, which had gone through at least fourteen editions before 1500 and was translated into several languages. It was a sort of mediaeval encyclopedia of natural history. It contains descriptions of garden flowers notable for their loveliness.

"The lily is an herb with a white flower. And though the leaves of the flower be white yet within shineth the likeness of gold." . . . "The rose of gardens is planted and set and tilthed as a vine . . . The tame rose hath many leaves set nigh together, and be all red; other almost white with wonder good smell . . And the more they be bruised and broken, the vertuouser they be and the better smelling. . . The rose arrayeth her thorn with fair colour and good smell . . . and when they be full grown they spread themselves against the sun rising. . . Among all flowers of the world the flower of the rose is chief and beareth the prize. And by cause of vertues and sweet smell and savour. For by fairness they feed the sight; and pleaseth the smell, by odour, the touch of soft handling." . . "Violet is a little herbe in substance and is better fresh and new than when it is old. And the flower thereof smelleth most . . . And the more vertuous the flower thereof is the more it bendeth the head thereof downward. Also flowers of springing time springeth first and sheweth summer. The littleness thereof in substance is nobly rewarded in greatness of savour and of vertue." . . . "The apple trees maketh shadow with thick boughs and branches, and fair with divers blossoms and flowers of sweetness and liking: with good fruit and noble. And is gracious in sight and in taste and vertuous in medicine . . . some beareth sourish fruit and hard and some right sour and some right sweet with a good savour and merry."[10]

A mediaeval medical poem has the following, which testifies to the universal preference among their few flowers:

"Of ye rose yt spryngeth on spray
Schewyth hys flowris in someres day
It nedyth nogt hym to descrie
Everi man knowyth it at eye."[11]

The first real work on practical gardening, which obviously comes from actual experience in gardens, is the *Feate of Gardening* of Jon Gardener (probably 14th century). This is a poem in 196 lines, treating of setting out and grafting trees and vines, sowing seeds, setting out plants, and so forth. It contains the names of nearly 100 plants, of which only half a dozen are woody plants, and only the usual roses, lilies, iris, and violets are ornamentals. Included are the names of several wildflowers which would be found growing in the grass, such as are shown in the Unicorn Tapestries—daisies, groundsel, cowslip, primrose, buttercups, strawberries, and others.

It must not be forgotten, of course, that even the roses and lilies had medicinal uses and their presence in gardens is not wholly excused by their esthetic appeal. A herbal of 1578 says:

[10] Rohde, E. S. op cit. pp. 44-5.
[11] Rohde, E. S. op cit. p. 46.

"The juyce of Roses, especially of Roses that are reddest, or the infusion or decoction of them, is of the kinde of soft and gentle medicines, . . . It purgeth downewarde cholerique humours and openeth the stoppinges of the liuer . . also it is good against hoate feuers and agaynst the Jaunders. It is also good to be vsed against the shaking, beating, and trembling of the hart, for it driueth forth and dispatcheth all corrupt and euyl humours in and about the veynes of the hart. . . . The roote of the white Lillie . . . pounde with Hony, joyneth togither sinewes that are cut consumeth or scoureth away the vlcers of the head called achores, and cureth all manner of naughtie scuruinesse as well likewise of the head beard and face. .

A castle garden of 1470, with raised beds arranged in checker-board fashion and an ornamented iron fence. The figure illustrates several mediaeval garden operations. (Reproduced from Sir Frank Crisp, Mediaeval Gardens, Vol. 1, Fig. 48.)

The same boyled in vineger causeth the Cornes which be in the feete to fall off if it be kepte upon the said Cornes as a playster by the space of three dayes without removing. . . . The decoction of violets is good against hoate feuers and inflammation of the Liuer . . . The syrupe of Violets is good against the inflammation of the lunges and breast, and against the Pleurisie, and cough, . . . The same Syrupe cureth all inflammation and roughnesse of the throte."[12]

[12] Crisp, Sir Frank. *Mediaeval Gardens*. pp. 46-7.

Gardening is a conservative art; the detailed cultural instructions and the representations of garden tools of mediaeval times have a fairly modern semblance. Spades, rakes, hoes, pruning-knives, and the like looked much then as they do now. One set one's foot on a spade and pushed in the way with which we are all familiar. Exact directions for planting, watering, transplanting, and so forth, are to be found in the famous *Menagier de Paris* of 1393.

"First, be it noted that whatsoever you should sow, plant or graft in damp weather and at eve or early morn, before the heat of the sun, and in the wane of the moon, and you should water the stem and the earth and not the leaves. Item, you should not water in the heat of the sun, but at eve or in the morning . . ."

"Note, that if the caterpillars eat your cabbages, do you spread cinders beneath the cabbages when it rains and the caterpillars will die."

"If you would have grapes without pips, take at the waxing of the moon in the time when vines be planted, to wit in February, a vine plant with its root, and slit the stock right through the midst unto the root, and draw out the pith from each side. Then prune the stock and bind it all the length thereof with black thread, then plant the stock and manure it with good manure, and fill up the hole with earth above the join of the stock."

"If you would graft a cherry or a plum upon a vine stock, prune the vine, then in March cut it four fingers breadth from the end and draw out the pith from each side, and there make place for the kernel of a cherry stone, and put it and enclose it within the cut, and bind with thread the stock joined as is aforesaid."

"Item, you can graft ten or twelve trees upon the trunk or stump of an oak."

"Violets and gilliflowers sown in March or planted on St. Remy's day. Item, both of these, when the frosts draw near, you should replant in pots, at a season when the moon waneth, in order to set them under cover and keep from the cold in a cellar, and by day set them in the air or in the sun and water them at such time that the water may be drunken up and the earth dry before you set them under cover, for never should you put them away wet in the evening."[13]

In all this there is much good sense, the fruit of much careful and skillful gardening. There is the usual mixture of superstitions, which also are still with us. It is still possible to find gardeners who have a feeling that it is unwise to plant in the wrong phase of the moon. And the belief that it is fatal to water plants in full sunlight is evidently at least 500 years old and dies hard.

Beds for herbs and vegetables were of much the same shape and arrangement in the fifteenth century as in the ninth. Flower-beds might be raised, the soil retained by facings of stone or wood. Potted plants were set out on parapets or on the beds, and tree-like arrangements of iron were constructed in which small plants might be set or over which vines might be trained so as to make artificial trees. The beds were commonly arranged in a checkerboard, and the part devoted to flowers enclosed in a fence of palings or lattice.

Many old pictures bear witness to the varied uses of gardens. Tables were set out, often under a canopy of roses, and meals were served. The central basin or pool was apparently used for bathing. The frequent

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[13] Menagier de Paris. 1393.

representations of Bath-Sheba or Susannah bathing her feet in a castle garden must reflect established mediaeval customs. When we consider the sanitary facilities of the castles, such a custom seems highly laudable.

A Hortus Conclusus in the City of God. The details are symbolic of divine love and sacrifice, of purity, and of everlasting life. (From the Grimani Breviary, reproduced from Sir Frank Crisp, Mediaeval Gardens, Vol. 1, Fig. 68.)

From earliest times gardens had religious aspects, even outside of monasteries, and the flowers grown in them were associated with divine persons and concepts. This is expressed in many paintings by the old

masters, who showed gardens peopled by companies of saints or by the Holy Family; who, in fact, when they represented the persons of their religion, usually placed them in gardens and surrounded them with flowers. Such a garden was often known as a "Mary garden." Though symbolic in detail, it undoubtedly represented current fashions in the art of gardening. Frequently it was an enclosed garden, a hortus conclusus. Of course all mediaeval gardens were enclosed, often by battlemented walls; but the hortus conclusus was an enclosure within the garden and separated from the rest of it by railings or a wall. One of the most exquisite of the many symbolic representations of gardens is the hortus conclusus in the picture of the Civitas Dei from the Grimani breviary. On one side is a *Plantatio Rosae;* roses signifying the passion of Christ, the blood of the martyrs, and so divine love in general. On the other side a group of lilies is labeled *Sicut Lilium inter Spinas;* lilies, of course, were especially consecrated to the Virgin and represent purity. The *Fons Ortorum* pours forth the waters of life, and is surmounted by the dove of the holy spirit. Other flowers had similar definite meanings. The vine was the rod of Jesse, that stem to which mediaeval Teutonic princes liked to trace their ancestry. The iris referred to the royal descent of Jesus, a concept very important to those who ruled by divine right; it would be unthinkable for a mediaeval prince to worship a commoner. Lilies-of-the-valley stood for humility, daisies for innocence, and strawberries were the fruits of righteousness. Carnations had much the same significance as roses, and are often shown in pictures of the Virgin and Child. Columbines refer to the gifts of the Holy Spirit. In many Mary gardens apples are conspicuous, the symbols of the sorrows of the earth; while cherries signified the joys of heaven.

In the works of the great painters of the Renaissance we see clearly the passing of mediaeval times and the development of modernity in gardens as in other arts. Houses might still be walled to keep out thieves by night and beggars by day, but were not planned to stand a siege. Commoners acquired wealth and power, and merchants built gardens in cities. Even the Goodman of Paris evidently had a considerable garden, though illustrations of early mediaeval towns commonly show us a huddle of houses with scarcely room for an occasional tree. In the 16th century elaborate gardens were laid out in the country, around country residences. A Flemish tapestry of about 1600 shows an unwalled garden set like a jewel in the midst of a beautiful countryside. The form of the gardens themselves is still mediaeval, and many wars were yet to desolate the fields of Flanders. But the intervals of peace were longer, long enough to encourage men to build for peace. The skill and the love of beauty of mediaeval craftsmen had escaped from the cramped enclosures of cloisters and castles.

Six New Courses Of Study Offered In Garden's Educational Program

SIX new courses of study in horticultural subjects and a series of conducted greenhouse tours are announced in the new edition of the Educational Program of the New York Botanical Garden which is being issued this month.

In addition, ***Garden Construction*** will be substituted for the former course in Rock Garden Construction. It will include demonstrations and practice in the building of dry walls, flagged paths, driveways, pools, curbs, and terraces, as well as rock gardens, and will be given in the spring of 1942, under the instruction of Mr. A. C. Pfander.

The Literature of Gardening will be offered again this fall, Monday afternoons at 2:30 instead of evenings. Miss Elizabeth C. Hall will be the instructor, and tea will be served by the Garden at the close of each session.

The ***Three-day Short Course in Practical Gardening,*** in which 75 individuals enrolled for the two sessions offered last April, will be repeated in the spring of 1942 under the same six instructors.

The new courses, details of which are given below, are a ***Two-day Short Course in Disease and Pest Control,*** to be taught by Drs. E. P. Felt, C. C. Hamilton, P. P. Pirone, and Cynthia Westcott; ***Vegetable Gardening*** under John Watts; ***Planting the Home Grounds,*** with P. J. Van Melle as instructor; ***Choice Plant Material,*** an advanced course under J. G. Esson; ***Garden Management,*** an autumn and a spring term to be given by T. H. Everett; and ***Flower Arrangement,*** a series of six afternoon sessions to be taught by Max Schling, each meeting of the class to be followed by tea.

Plants of Latin America will be emphasized in the four conducted greenhouse tours to be led by Howard Swift, who initiated the Garden's first Sunday morning tours last winter.

Copies of the new Educational Program will be sent free upon request. Details of the new courses follow.

8A TWO-DAY SHORT COURSE IN DISEASE AND PEST CONTROL

The course will deal with the fundamentals of disease and pest control and will consist of lectures, demonstrations, and laboratory and field practice under the supervision of specialists. The subjects covered in demonstrations during the two days will include such practical aspects of the work as: Sterilization of Soil, Protection of Lawns, Mixing and Application of Sprays and Dusts, and Recognition of Common Pests. The lecture topics will include: Insect Enemies, Nature and Causes of Disease, Sanitation in the Garden, and Soil Pests and Their Control. Enrollment limited to 50 students. *Registration must be received by May 19, 1942.*

The class will meet for 4 sessions on Tuesday and Wednesday, June 2 and 3, 1942, 10 a.m. to 12 noon and 1:30 to 4:45 p.m. daily. $10.

Instructors—Drs. E. P. Felt, C. C. Hamilton, P. P. Pirone, and Cynthia Westcott

9A VEGETABLE GARDENING

The principles and practices of vegetable gardening with special reference to home production are taught in twelve lectures. The instruction covers Choice of Site, Garden Layout, Soil Preparation, Manuring and Fertilizing, Selection of Varieties, Planting for Succession, Care through the Growing Season, and the Harvesting and Storing of Crops. The use of hotbeds and coldframes is covered and the cultural requirements of individual crops are discussed in detail.

Class meets Mondays, 7:45 to 8:45 p.m., January 19 to April 20, 1942, but excluding February 23 and Flower Show Week. Minimum registration 20. $10.

Instructor—Mr. John Watts

10A PLANTING THE HOME GROUNDS

This course provides practical guidance for the development of small properties.

In twelve lectures a review is given of the practical elements in the development of the suburban home landscape. Topics include: Logical Division of the Plot, Grading and Soil Conditioning, Lawn Making, and the Selection and Planting of Permanent Materials for Shade, Boundaries, Hedges, Ground-covers and other special purposes.

Class meets Mondays, 7:45 to 8:45 p.m., Sept. 29 to Dec. 15, 1941. Minimum registration 20. $10.

Instructor—Mr. P. J. van Melle

11A CHOICE PLANT MATERIAL

(*Advanced Course*)

This subject is designed to meet the needs of those who are familiar with ordinary garden practices and who have an introductory knowledge of plant materials. It is not elementary. In twelve lectures, a selection of the best garden plants is presented and their individual merits are discussed. The discussion includes their adaptability to special purposes, their propagation and culture, and botanical information which is considered of importance or interest to the gardener. The choice of materials includes Trees, Shrubs, Evergreens, Ground-covers, Roses, Herbaceous Border Plants, Rock Garden Plants, Annuals, Aquatics, Bulbs, and Greenhouse Plants.

Class meets Mondays, 7:45 to 8:45 p.m., Jan. 18 to April 19, 1943, excluding February 22 and Flower Show Week. Minimum registration 20. $10.

Instructor—Mr. J. G. Esson

GARDEN MANAGEMENT

Opportunity is given the student to become familiar with garden operation and management. Each week the class is taken to those places in the Botanical Garden where work of significance is being done, the reasons for and the methods of doing the work are explained, and in many cases the students are called upon to assist. A discussion of the tasks which need attention during the coming week and inspection of the results of work previously done are included at each session. The operations and practices which are discussed and demonstrated are those appropriate to the season and important to the efficient maintenance of the garden.

12A ***Autumn Term*** –Class meets for eight sessions, Tuesdays, 2:30 p.m. to 4:30 p.m. September 23 to November 11, 1941. Enrollment limited to 25. $10.

12B ***Spring Term***—Class meets for eight sessions, Tuesdays, 2:30 p.m. to 4:30 p.m. April 21 to June 9, 1942. Enrollment limited to 25. $10.

Instructor—Mr. T. H. Everett
with assistants.

13A FLOWER ARRANGEMENT

The arrangement of flowers for home decoration and for personal use. This course is not designed for commercial florists.

Six sessions of approximately one and one-half hours each to be given in the Members' Room on Monday afternoons at 2:30. The course will consist of lectures and demonstrations. It will cover such topics as table decorations, vase arrangements, color combinations, flowers for personal use, the proper care of flowers, their lasting qualities, and flowers for exhibitions.

Tea will be served by the Garden at the conclusion of each session. $15.

Jan. 12—Feb. 16, 1942 *Instructor*—Mr. Max Schling

All-America Selections Being Tested In Special Border At Garden

FORTY-SEVEN new varieties of familiar garden flowers are being grown this summer in a special border at the New York Botanical Garden. The plants, all of which are being raised from seed, will be the garden novelties of 1942. This public preview of them is being offered for the first time through the co-operative organization known as All-America Selections. At the end of the season a committee of judges will rate them for their horticultural merit. Meanwhile, the public is invited to visit the New York Botanical Garden to view the border and draw its own conclusions about the varieties offered.

The plants being tested this year include five sweet peas, ten marigolds, seven petunias, two verbenas, three zinnias, two cosmos, two snapdragons, and one each of morning-glory, gourd, spider-flower, ageratum, phlox, calendula, nasturtium, gilia, California poppy, stock, scabiosa, coneflower, cockscomb, larkspur, nierembergia, and cynoglossum.

Some of the winners of previous years are being shown beside them for comparison.

Since All-America Selections were started in 1932 at the instigation of Mr. W. Ray Hastings, who has been executive secretary of the organization since that time, this is the first year that the trial grounds have been at the New York Botanical Garden. They are located in a 12-foot border 150 feet long beside the path which leads from the Main Conservatories to the Museum Building.

Simultaneously, in eleven other locations in other parts of the country, the same 47 kinds of plants are being tested. Nearest to New York is the new trial ground at Pennsylvania State College, where Dr. E. I. Wilde, Professor of Floriculture, will serve as a member of the council and as a judge. T. H. Everett will represent the New York Botanical Garden on the council for All-America Selections, and thus, at the end of the season, will help to select the prize-winning plants from the group. Next year, seeds of all these new varieties will be introduced through the nursery trade, where they will be labeled *All-America Selections.*

While the Garden is donating space for the plants and giving them the care they require through the summer, the expenses of the trials here are being borne by the New York Florists' Club, the A. T. De La Mare Publishing Co., and the following group of seedsmen:

American Bulb Co., Inc., Burnett Brothers, Inc., Burnett Seedsmen, Inc., Fight Floral Company, Fred C. Gloeckner & Co., Inc., Peter Henderson & Co., Herbst Bros., Roman J. Irwin, Max Schling, Seedsman, Frank G. Sealey Co., Inc., S. S. Skidelsky & Co., Stumpp & Walter Co., and Vaughan's Seed Store.

Graduates From Two-Year Courses Hear Address By E. K. Balls, Explorer

THIRTY-FOUR certificates were presented to members of the New York Botanical Garden's two two-year courses -the Science Course for Professional Gardeners and the Course in Practical Gardening at graduation exercises conducted in the Museum Building the evening of June 26. E. K. Balls, famous British plant explorer, a number of whose discoveries adorn the Thompson Memorial Rock Garden, gave the principal address. He spoke on exploration and the part it plays in the development of horticulture.

"Horticulture," he said, "was once a regal entertainment; now it is within the reach of everyone, and flowers from all over the world are grown side by side in gardens."

Some of the first of the foreign plants that were introduced into gardens were brought to England by missionaries and other travelers who went into distant lands with the main object of finding food plants. First they brought in dried specimens of flowers. The interest in these induced them to gather seeds on later trips and then, when they could, to collect and carry back living plants.

Queen Victoria's reign in England, he pointed out, saw the rise in popularity of exotic greenhouse flowers. The 20th century saw the launching of many expeditions sent out deliberately to gather plants for general horticultural use.

Mr. Balls emphasized the fact that experience is needed in handling such seeds and plants, for there are many risks to be taken in attempting their propagation. Five hundred kinds may come in from a single expedition, he said, and if from 1 to 5 percent of these are still in cultivation after 25 years, then the expedition has been a success. To those who wish to go plant-exploring he advised not to go looking for special plants, but rather to choose a district for a certain type of vegetation and collect whatever it offers. Re-collecting lost plants, however, is a special field, and he spoke of the satisfaction of seeking and finding some of the gems that had long been lost to cultivation.

The routine of collecting, he warned, is a tedious one, for complete records must be kept of all that is gathered. Seed, for example, must be fully annotated with accompanying dried specimens. A similar responsibility falls on the gardener who receives the new material, for it is up to him to keep the labels straight. Normally, he said, labels are lost in five years—a misfortune, for without them many records become valueless.

Although he is looking forward to the time when expeditions can be resumed, the speaker reminded the graduating gardeners that the field for collectors was small. One man, he said, can collect enough material alone to keep three or four hundred gardeners busy for several years.

After Mr. Balls' address, Mr. Francis E. Powell, Jr., newest member of the Garden's Board of Managers, presented the certificates to those who had successfully completed two years of study in the two evening courses.

Dr. William J. Robbins also addressed the graduates and their guests. The National Association of Gardeners, in cooperation with which the Botanical Garden originally established its Science Course for Professional Gardeners, was represented by Mr. Kenneth Hadland, Second Vice-president, and Mrs. Dorothy Ebel Hansell, Secretary.

More than 150 guests attended the exercises, after which refreshments were served by the Garden.

One student was graduated from both courses at once.

The Botanical Garden's own student gardeners who received certificates in the Science Course for Professional Gardeners are William P. Feltges and Philip Spear, who are now employed at the Garden, and Edward Raymond Briggs, Robert B. Fisher and Robert Simpson, who have obtained jobs elsewhere. The other men who graduated from this course are Irving Granek, Gilbert Guille, Frank Marchiselli, Rudolf Persson, William Scully, and Philip J. Weber.

Graduates in the Two-year Course in Practical Gardening include, from New York City, Bernard A. Benn, Francis

Breen, Theodore Cernik, Zita Connolly, Oscar Lensman, William Paschke, Jr., Rudolf Persson, Anton Sarovec, Jr., Anettie C. West; from the Bronx, Anne Fischer, Elizabeth C. Hall, Frank Melillo, Nathan Tankenbaum, Alexander Tiani, Belle Weisberg, Robert Wolfert; from Long Island, Ruth M. Barron, Mary Dixon, Teresa Morganweck, Johnson Shipman, Norman Smith; from Staten Island, Margaret Spollen; and from Bronxville, Eleanor Whitaker.

Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Especially for Gardeners

BETTER LAWNS. Howard B. Sprague. 205 pages, illustrated and indexed. Whittlesey House, McGraw Hill Co., New York, 1940. $2.

A dozen well organized chapters dealing with turf, soil, fertilizers, humus, types of grass, planting, renovating, weeds and pests, written by a scientific man with a practical outlook.

THE GLADIOLUS. Forman T. McLean. 197 pages, illustrated, indexed. Whittlesey House, McGraw-Hill, New York, 1941. $2.

A manual of gladiolus history and culture with a chapter on recommended varieties. Written by a man who for many years has worked with gladioli and has been looked upon as a leader among gladiolus enthusiasts.

I LIKE GARDENING. Jean Hersey. 234 pages, illustrated. Hale, Cushman & Flint, Boston, 1941. $2.

The title of the first chapter, "Gardening for Fun," sets the style of this book, which deals with annuals, perennials, herbs, rare vegetables, fragrant plants, flowers for the evening, and many other types of plants for year-around bloom and pleasure. The chapter "Goblins in the Gardens" deals gaily and practically with pests.

THE FLOWER FAMILY ALBUM. Helen Field Fisher and Gretchen Harschberger. 64 pages, illustrated and indexed. Published by the authors, Shenandoah, Iowa, 1940. $1.40.

Especially helpful for gardeners who will derive greater joy from their plants when they understand the structure of the flowers and how it determines family relationships. Pages of drawings are alternated throughout the book with pages of text.

HERBERTIA 1940 (Vol. 7). Edited by Hamilton P. Traub. 242 pages, illustrated with 13 plates and 41 figures The American Amaryllis Society, Orlando, Florida, March 1941. $3 25

This year's volume, dedicated to Latin America, in several articles brings attention to the blue amaryllis from Brazil (*Hippeastrum procerum,* called there *Amaryllis*) of which the New York Botanical Garden had several specimens in bloom last winter. The usual type of material, of importance to all who grow any member of the Amaryllis family, is presented -description, classification, culture, propagation, genetics, comments on new or little known species and hybrids, and, in addition, biographical notes and tributes to some of the leaders in amaryllid culture.

Flowers of Japan

SAKURA — JAPANESE CHERRY. Manabu Miyoshi. Tourist Library No 3 74 pages, illustrated.
JAPANESE GARDENS. Prof. Matunosuke Tatui Tourist Library No. 4. 111 pages, illustrated. Third edition.
FLORAL ART OF JAPAN. Issotei Nisikawa. Tourist Library No. 11. 106 pages, illustrated.
FLORAL CALENDAR OF JAPAN. T. Makino and Genziro Oka Tourist Library No. 20. 82 pages, illustrated

P. D & Ione Perkins, South Pasadena, Calif. 35 cents each.

These four little paper-covered books of about 100 pages each from the Tourist Library of twenty or more volumes issued a few years ago in Tokyo and now made available in this country, give an attractive picture of the flowers and gardens of Japan and their significance. They are all pleasingly illustrated, partly

in color, and they contain convenient guides to the pronunciation of Japanese names.

Pocket Size

A BOOK OF ROSES. J. Ramsbottom. 30 pages, 16 plates. The King Penguin Books, Harmondsworth, Middlesex, England; Penguin Books, New York, 1939. 50c.

Sixteen miniatures in color taken from Redouté's famous work, preceded by text and descriptions and a pleasing sketch of the artist.

THE GARDENER'S CALENDAR. E. M. H. Cox 64 pages. Chatto & Windus, London; Transatlantic Press, Forest Hills, New York, 1939. 30c.

A line for every day in the year with random suggestions for the practical gardener. In the back are botanical names of more than 500 garden plants, listed alphabetically by their common names.

Working With Young People

YOUTH IN MUSEUMS. Eleanor M. Moore 115 pages, illustrated and indexed. University of Pennsylvania Press, Philadelphia, 1941. $2.

A study of the various types of museums for children and of projects for children in museums for adults, based on the experience of those institutions which have made a point of catering to young people, not only as the backbone of the nation but as "the lifeblood of museums." The book consists largely of quotations from persons directing such work.

NATURE GAMES BOOK. Elmo Stevenson. 208 pages, indexed and illustrated Greenberg, New York, 1941. $2.50.

Methods of interesting the very young in the observation of nature by means of games.

Notes, News, and Comment

Radio. Three radio broadcasts dealing with the Garden's services to the public have been recently given over WOR on the program conducted by Bessie Beatty. Carol H. Woodward was interviewed over the air July 11 on the New York Botanical Garden as a vacation spot; T. H. Everett gave advice to gardeners in response to questions the morning of July 17, and Dr. B. O. Dodge told of some of the Garden's work in disease and pest control August 1.

Vitamin Conference. On July 22 Dr. W. J. Robbins presented a paper dealing with the water soluble vitamins in relation to plant physiology before the Vitamin Research Conference, which was held July 21-25 under the auspices of the American Association for the Advancement of Science at Gibson Island, Md.

Groups. During the week of July 16, the Garden was visited by 80 members of the Park Association of New York City, Inc., and also by 23 members of the Fordham University Summer School, both groups being guided to special points of interest by members of the staff.

Student Gardeners. Four student gardeners and one apprentice have recently left their work at the New York Botanical Garden. Raymond Briggs and Arthur Bauer have accepted positions with the New York City Park Department. Herbert Bragg and John Dowton left in July in response to the draft. William Brown, apprentice, is now a gardener for Mrs. Henry A. Clark, Flushing, Long Island.

Visitors. Dr. R. E. Holttum, Director of the Botanic Gardens at Singapore, spent June 26 and 27 at the New York Botanical Garden. Dr. H. S. Jackson of the University of Toronto was here for a day; also Dr. T. H. Goodspeed of the University of California. Others among the numerous botanists, horticulturists, students, and amateurs, who have been working in the library or herbarium or visiting members of the staff during the past two months have been:

E. C. Stakman, University of Minnesota; R. E. Schultes, Harvard Botanical Museum; Frank E. Egler, New York State College of Forestry; Clyde Fisher, American Museum of Natural History; John Gill, Haddonfield, N. J.; Agustin Gomez y Gutierrez, Mexico City; Hugh F. Fitzpatrick, Ithaca, N. Y.; Marjorie J. Camp, U.S.D.A., Washington, D. C.; Julio A. Erz, Rosario, Argentina; R. T. Clausen, Cornell University; Brother Albert Gerard Horn, Manhattan College; John B. Woodward, Bridgeport, Conn.; Sister Florence Marie, Seton Hill College, Greensburg, Pa.; Mary K. Donovan, Boston, Mass.; Alice Mary Russell, Philadelphia, Pa.; Walter H. Belda, Milwaukee; Adrian Frylink, Babylon, L. I.; Mrs. Sydney Lawrence, Anchorage, Alaska; Mrs. Stephen F. Strong, Beverley Hills, Calif.; Velva E. Rudd, U.S.D.A., Washington, D. C.; Elmer A. Claar, Wilmette, Ill.; Edgar T. Wherry, University of Pennsylvania; Ilda McVeigh, Yale University.

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 figures, covering algae, fungi, mosses, ferns, flowering plants. 1918. $3.50

A Text-Book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Hardy Ferns and Their Culture. Edited by Carol H. Woodward. 40 pages, illustrated; bound in paper. 25 cents.

Plants of the Holy Scriptures by Eleanor King, illustrated, and accompanied by a list of Plants of the Bible with quotations, in the March 1941 Journal. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward, illustrated, in the May 1941 Journal. 15 cents.

Periodicals

Addisonia, annually, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Now in its twenty-first volume. Subscription price, $10 a volume (four years). Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1 a year; single copies 10 cents. Free to members of the Garden. Now in its 42nd volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $7 a year; single copies $1.25 each. Now in its thirty-third volume. Twenty-four Year Index volume $3.

Brittonia. A series of botanical papers. Subscription price, $5 a volume. Now in its fourth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes, each to consist of four or more parts; 90 parts now issued. Not offered in exchange. Prices of the separate parts on request.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each, $5 a volume. In the 14th volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Prices to members of the Garden: Vols. 1-6, $1.50 each; to others, $3. Vol. 7, $2.50 to members; to others, $5. *Contents*: Vol. 1, PER AXEL RYDBERG, An Annotated Catalogue of the Flora of Montana and the Yellowstone Park. Vol. 2, D. T. MACDOUGAL, The Influence of Light and Darkness upon Growth and Development. Vol. 3, ARTHUR HOLLICK and E. C. JEFFREY, Studies of Cretaceous Coniferous Remains from Kreischerville, N. Y. Vol. 4, C. STUART GAGER, Effects of the Rays of Radium on Plants. Vol. 5, NORMAN TAYLOR, Flora of the Vicinity of New York. Vol. 6, Twentieth Anniversary of The New York Botanical Garden. Vol. 7, N. L. GARDNER, New Myxophyceae from Porto Rico; A. B. STOUT, The Flower Behavior of Avocados; H. H. RUSBY, Plants Collected in the Amazon Valley; ARTHUR HOLLICK, The Flora of the Saint Eugene Silts.

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CAROL H. WOODWARD, Editor

September 1941

LEAF PATTERN WITH COLEUS — Cover Photograph by Samuel Seigel*

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* Through the co-operation of the W.P.A.

GIFTS FOR THE GARDEN

In this issue of the Journal are announced recent gifts to the New York Botanical Garden of a value totaling many thousands of dollars. One is a dual gift of flower paintings and chairs of native wood presented by the Australian Government, another a collection of living cacti from the Government of Mexico; and a third, 9,572 orchid plants from an individual who, like the government representatives, realized that a responsible public institution was the most suitable place for such treasures.

It is by usable gifts—sometimes of objects and specimens, sometimes of money—that an institution like the New York Botanical Garden is able to contribute to the public good. Those who make the gifts are only in rare instances the ones who reap the fullest benefit from them, except in the satisfaction of their usefulness to others. But when schoolboys, art students, nature students, scientists and travelers, among other persons, are seen standing attentively in front of the paintings of Australian wild flowers, while thousands more on a single Sunday gaze enraptured at the orchids and cacti in the conservatories and enjoy additional displays that bequests and other donations have partly made possible, there can be no question but that gifts like these are well placed for the greatest benefit of the greatest number.

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Plant Life And The Law Of Man

I—Growth Rings In The Determination Of Age Of Trees

By E. H. Fulling

DURING the past two years the writer has been engaged more or less regularly in examining hundreds of court records with the purpose of assembling material which may some day merit publication as a volume bearing the title of this article. It is planned that this account shall be a study of legal relations among men as a result of their dependence upon and general association with plants. Strictly legal aspects of litigation are to be overlooked as much as possible; emphasis is to be placed upon the roles which plants have played in litigation and upon the attitudes of courts toward our alleged understanding of plant life. Completion of this study is so much a matter of the future, however, that it appears desirable to publish from time to time particularly interesting cases as they come to the attention of the author, and herewith is presented the first of these instalments.

IN the early days of colonization in America, when land grants were made or estates were otherwise established, the boundaries of such tracts very frequently were determined by the locations of particular trees and by specific mention of them in the public records. Surveyors ran their lines to such trees and marked them by inflicting chop marks, or blazes, with an axe upon their trunks. Years later the identity of such boundary trees often caused trouble, for either the trees no longer existed or the chop marks had become obliterated by the new bark which grew over them. It would then become necessary when re-establishing boundary lines to measure recorded distances in prescribed directions from specified points, but this labor was usually avoided so long as the trees could still be spotted. It was the conflict between these two methods and the identity of a boundary tree in a particular instance which directs our attention to the records of the High Court of Chancery of Maryland more than a century ago, in 1829.[1]

[1] Patterson v. McCausland, 3 Bland (Md.) 54.

It appears that in 1788 a certain tract of land was laid out in what is now part of the State of Maryland, and that this tract was known as Long Fought and Dear Bought, a title which spurs one's imagination respecting the history of the area and the details of its acquisition. Three years later a neighboring tract, Jolly's First Attempt, was also laid out, and once more we are reminded that names in those days were more than mere designations. Forty years later there was a resurvey of these two tracts as well as of adjoining land, and then the trouble began.

In the original description, Jolly's First Attempt was recorded as having a black oak at one point, a white oak at another, and a second white oak at a third point. In resurveying the area the surveyor drew his lines to trees which he regarded as being those thus specified, and in designating what he considered the original black oak, the land was brought so close to the other tract that both of them bordered on one another and to some extent interlocked. The result was that a third parcel of land, access to which had always been between the other two previous to the resurvey, was deprived of that access. The owner of this third parcel claimed the resurvey was wrong in thus blocking his property and he brought the matter into court.

In court he contended that his property had been closed by running one of the boundary lines to the black oak found by the surveyor, and that that tree was not the black oak mentioned in the original specifications. He and several others similarly interested in the matter demanded that the resurvey be made by measurements from various points and not merely by drawing the lines to certain trees then standing in the belief that they were the original trees.

Their principal effort in attempting to prove misidentity of the black oak rested upon a block of wood which they introduced into court. They had in some way cut it out of the tree and claimed that it contained the whole of the only chop mark on the tree. Witnesses in behalf of the surveyor testified that the tree was the original one to which the line had been drawn in 1791 and that the chop mark had been made at that time. This could not be so, the plaintiffs protested, because there were only 12 concentric layers of wood outside the mark, which had healed over, leaving a scar, whereas if it had been the original tree and mark there should have been at least 36 annual layers. There was not any other tree which they claimed to be the correct tree, and the question as to whether it was or was not a black oak never entered the case; the true boundary tree, by implication, had disappeared, and all they sought to establish was that the tree then standing was not the original.

This argument was founded in court upon the contention there that "according to the regular and uniform course of Nature, there is in all trees one such concentric layer of wood always formed every year."

This, of course, is generally true of all woody perennial dicotyledonous plants in the Temperate Zones, and the exceptions to it would invalidate the general statement only under particular circumstances, and then usually only to a certain degree and not entirely. Therefore, introduction of the block of wood and of the accompanying argument was a perfectly reasonable bit of evidence on the part of the plaintiffs to support their plea. But the High Court of Chancery cast doubt upon the truth of the contention, and the justice who wrote the final report indulged in a most extensive botanical discussion. He must have been a versatile scholar, much given to extra-curricular study, or had capable assistants, for 24 pages of the report are devoted to the longevity of trees and the physiology of growth. By way of citation the justice founded this prolonged dissertation upon Michaux's "North American Sylva," Roget's "Animal and Vegetable Physiology," Loudon's "Arboretum et Fruticetum Britannicum," Darwin's "Phytologia," Rees' "Cyclopaedia," Eaton's "Botanical Grammar and Dictionary" and several other botanical references of the early nineteenth century. After this lengthy and very verbose essay, the justice finally turned to the case in hand and commented upon the evidence:

> "In this case the block here produced, has been cut out so deep from the trunk of this black oak, as to include, with the bark and all the newly formed layers of wood, eighteen others which had formed when the chop mark was made. Judging from the appearance of the block, and the segment of the circle formed by its outside, I should suppose that the tree was about one foot in diameter, and was at present in a youthful and vigorous state of vegetation. The block distinctly exhibits the new wood as being in every way perfectly united over the whole of the chop mark. Immediately over the chop mark there is much horny wood in which no concentrical layers are visible; but on one side of the chop mark, and where the concentrical layers appear to be a perfectly natural continuation of those into which the chop mark had been made, there can be counted no more than twelve additional concentrical layers. These new layers differ very much in thickness one from another, and altogether measure as much in diameter as the eighteen which had been previously formed. The whole or a part of the epidermis, or outside bark through which the chop mark was made, apparently still remains with a perfectly formed new bark so closed over it as to leave nothing more than a scar or cicatrice where the chop mark had been made.
>
> "The witnesses testify, that this chop mark was shown as having been made in the year 1791, now thirty-nine years ago, in accordance with which, if the hypothesis that each concentrical layer denotes the lapse of a year, be correct, there should have been found that number of concentrical layers; but there are no more than twelve; and consequently, the testimony of the witnesses, or the evidence derived from this hypothesis must be rejected. There is nothing whatever, in addition to this hypothesis, to impeach the credibility of the witnesses
>
> "I have nowhere met with the mention of any one single instance, in which the number of the concentrical layers, which could be distinctly counted, in the transverse section of the trunk of any forest tree, of a foot or more in diameter, had been found exactly to correspond with the years of its age, as otherwise well and positively known and ascertained. Yet it is most manifest, that until the regular, uniform, and exact coincidence between the number of the concentric layers in the wood of trees and the years of their age, has been so demonstrated by observation and proof, as the term of gestation of animals has been, *etc.*, there can be no clear and sure foundation for the hypothesis, that the number of such concentrical layers does denote the age of trees, or the progress of growth.

But even if this notion were shewn to be well founded, it would call for evidence destructive of that by which it was given. The production of the necessary evidence of the lapse of years, by cutting out, as in this instance, a block of sufficient dimensions to exhibit a distinct view of the number of concentrical layers, formed since the time in question, might occasion the death of the very boundary tree intended to be shewn and re-established; so that the production of such evidence would, by destroying that of which it had been a component part, prevent a recurrence to the same kind of proof thereafter; or, in other words, to prove a living boundary by such means, it would be necessary to destroy it. This hypothesis, however, resting, as it yet does, altogether upon speculation and conjecture, cannot be judicially regarded as affording evidence worthy of any consideration whatever."

So the testimony of certain witnesses to the effect that the tree under consideration was the correct tree, stood unimpeached, and the evidence of annual rings to the contrary bore little weight in the mind of the judge. It was ordered, therefore, that the boundary line to the tree should stand; the two tracts were brought together, and the owner of the third parcel was left to secure access to his property as best he could. Unfortunately, we are not told how much difference, if any, there was between determining the boundary in this manner and by course and distance, as the defeated plaintiffs had sought to obtain. It would have been interesting, indeed, had the results of the two methods been found to correspond, even if only approximately, but that is one of the aspects of the case which the records do not reveal.

How correct was the judge in casting such doubt on the significance of annual rings as indicators of age? The general question of their dependability must have frequently arisen, for in 1897 the United States Department of Agriculture published a pamphlet devoted to this very subject, entitled "Age of Trees and Time of Blazing Determined by Annual Rings." It was prepared by B. E. Fernow, then Chief of the Division of Forestry, and that author's comments respecting dependability of tree rings reads as follows:

"From what has been said, it is clear that for an ordinary tree, 100 years old, the record for the total age is exact within about three to five years; for a very old tree, 200 years and over, it is accurate to within about six to ten, or within 3 to 5 per cent, if the growth is fairly normal, but may be amiss by as many as twenty years and more, if stunted at any time."

Despite this allowance made for severe discrepancy under unfavorable conditions, the author goes on to say that:

"Since the reliability of the annual ring as a measure of age or time, that is, its essential character as annual ring, has often been a subject of controversy in this country, a few words by way of evidence in favor of the commonly accepted position may prove acceptable. The correctness of the rings as record forms a fundamental tenet in the science of forestry as practiced abroad, and has within the last half century been verified by tens of thousands of countings made on trees of all European forest species in almost all parts of Europe, and on trees where time of seeding, planting, age of plant stock, *etc.*, were accurately known from permanent records. Generally these countings were made for purposes other than the mere determination of age, but nevertheless serve today as incontrovertible, accurate evidence at least for Europe and its species. But there are also in the same countries, especially France and Germany, thousands of similar

records for American species, white pine, red oak, *etc.*, which in all cases bear out exactly the same results. In addition, we have in our own country many hundred countings on record and thousands more not permanently recorded, proving the same for the forest species of the temperate zone in the United States."

Concerning evidence to the contrary, he wrote:

"The most striking contradictions ever printed were due to the mistaking of well-known features of wood structure, as for instance, the wavy markings on elm, for annual rings; and all so called investigations of this subject leading to contradictions were performed, not on forest trees, but in apple and peach orchards, and by men who failed in their attempt to count what actually existed. A few of the most striking cases of this kind came to this Division from Kansas and Nebraska, which, when the actual specimens were sent, proved not the fallacy of the ring record, but the utter ignorance on the part of the men attempting to disprove a theory which had for more than a century been a help to the practical forester of Europe—as important as his ax and saw."

Finally, with respect to the chop mark or blaze itself, Fernow thought:

"It is evident from what has been said, that the chip covering the blaze itself does not furnish information as to what time a blaze was made in a given tree, since here all rings are not necessarily represented. To find how many years ago the cut was made, it is necessary to have a cross section of the stem, or at least a part of a cross section. Then the number of rings may be counted from bark to pith and the particular ring leading to the edge of the wound may be traced from the wound to the radius along which the counting is done."

It was well recognized at the time this was written that ring counts are influenced by climatic conditions, by the particular radius along which counts are made, by elevation above the ground of such radius, and by a number of other factors, so that the general recognition given the rings as indicating age is scarcely any less justified today than fifty years ago. One is inclined to conclude, therefore, in view of this testimony and of the fact that there was so great a discrepancy as 24 years within a period of 36 years, that greater value should have been placed on the block of wood and that the plaintiffs should have presented evidence supporting their reliance on it. There apparently was not any botanical testimony concerning the reliability of annual rings, and the learned justice was compelled to pass judgment on a matter probably wholly foreign to him except for the questionably pertinent remarks in the authorities which he cited. There probably were only 12 annual rings outside the blaze, and that count may not have been a true measure of the lapse of time since the blaze was made, but the writer is inclined to believe that if the count was to be disqualified, it should have been done on evidence that the count was inaccurate and not on the generalization that annual rings were unreliable. Finally, we look in vain for any evidence in the record that the blaze under discussion really was a surveyor's chop mark, and not merely some other wound inflicted on the tree.

* * *

It will be interesting to note, as additional cases are studied, any change of attitude on the part of courts toward this matter, if there be any. This can not be done at once because the various legal indices do not direct one to matters of litigation interesting to the botanist. It is only by digesting the varied cases as they are discovered that a complete story of any one topic can be assembled.

Espalier Dwarf Fruit Trees

By John Watts

IF you wish to add a distinctive note to your garden, whether it be in the flower or vegetable plot, then by all means plant some espalier dwarf fruit trees. Their economic value in the production of fine fruit as well as their beauty when they are well cared for will repay the grower for the little trouble they give. They are especially effective if planted sufficiently far apart to make each tree's outline distinguishable at a distance.

Apples and pears are the most adaptable fruit trees, but cherries and some of the plums may also be used if the form of the espalier is kept simple. Peaches are likewise suitable subjects but require a different

Photograph by Fleda Griffith

Apple and pear trees trained as dwarf espaliers form an attractive boundary between two sections of a garden.

treatment from the others in the matter of pruning. There is a place in every garden for at least one espalier fruit tree, and many pleasing effects can be obtained by using them in various patterns.

Dwarf espaliers are not the novelty that they are commonly thought to be. Centuries ago, horticulturists found that by grafting fruit tree scions on certain root stock, they could obtain trees which while in a young stage would produce fruit and could be easily managed. The next step forward was to train the dwarf tree into some sort of shape so that it

could be placed against any suitable background, and it is from this that there developed the numerous forms that are grown today—shapes that will fit into any picture.

The single cordon, which is the simplest form, is an erect vertical stem, and is used by itself or in combination with other shapes to complete a design along a wall or trellis. The horizontal two-armed cordon is used to edge the walks of vegetable or fruit gardens. It is usually about twenty-four inches high, but can be grown to almost any height to suit one's need. There are shapes and forms grown today to fit almost any location one desires, such as between windows, against high or low walls or simple wire fences, or trained along horizontal lath fences inexpensively erected. Almost any structure that will keep the leaders in their place and secure them against strong winds and storms will serve to support the branches.

Until recently, espalier fruit trees were grown chiefly in European gardens and only a few Americans used them as landscape features. Today, however, more American gardeners are realizing the advantage of growing this type of fruit tree, either for the utilization of space that might otherwise be wasted, or as an attractive hedge between the flower and vegetable garden.

Espalier trees are easy to care for; the difficult task of grafting and training has already been done in the nursery. Once the trees are planted a knowledge of pruning is about all that is required, although, since these trees are subject to the same attacks as orchard fruit trees, one must know how and when to spray for different insects and diseases. Where they are to be grown against a wall or building, it is advisable to stretch wires or build a trellis about twelve inches from the wall to permit the circulation of air around the trees. This will prevent the foliage from being stunted and will give the wood a better chance to develop and ripen.

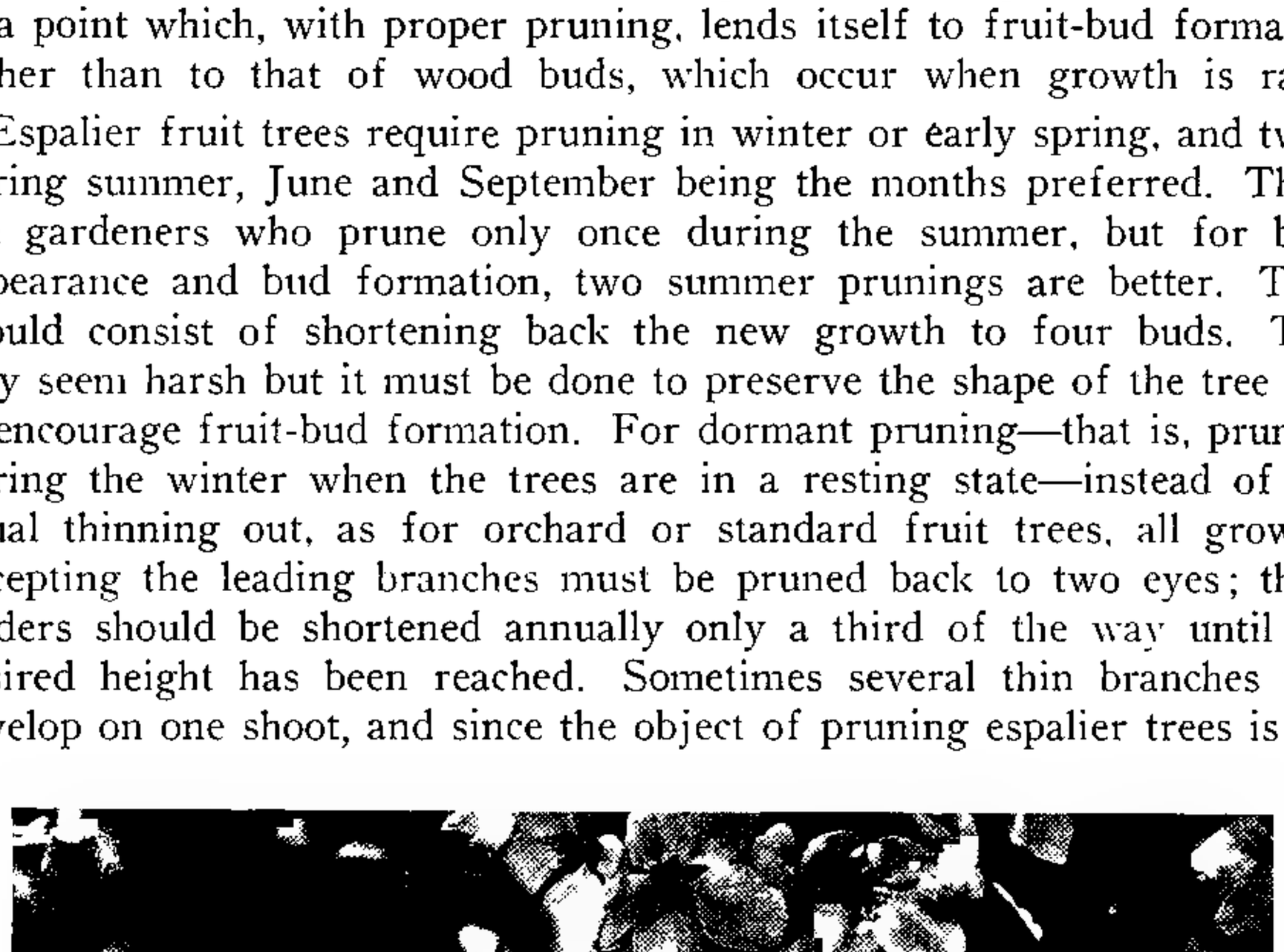
Like all other fruit trees, espaliers require a well-drained site and fertile soil which has been mixed with some thoroughly rotted farm manure. Where the natural drainage is not adequate, artificial drainage should be prepared as follows:

A trench is dug to a depth of about two feet below the surface of the soil. Agricultural tile is laid down and continued in a slope to a point lower than the bottom of the tree. Special care must be taken to keep the opening clear so that the surplus water will have a chance to run off.

Experience has proved that to produce an abundance of fruit on espalier trees, the roots of the trees must be confined to a small area and must not be allowed to travel too far away. Flat stones or slabs of slate placed underneath each tree for an area of several feet will prevent the main roots from penetrating below, and will make them grow outward, thus facilitating root-pruning.

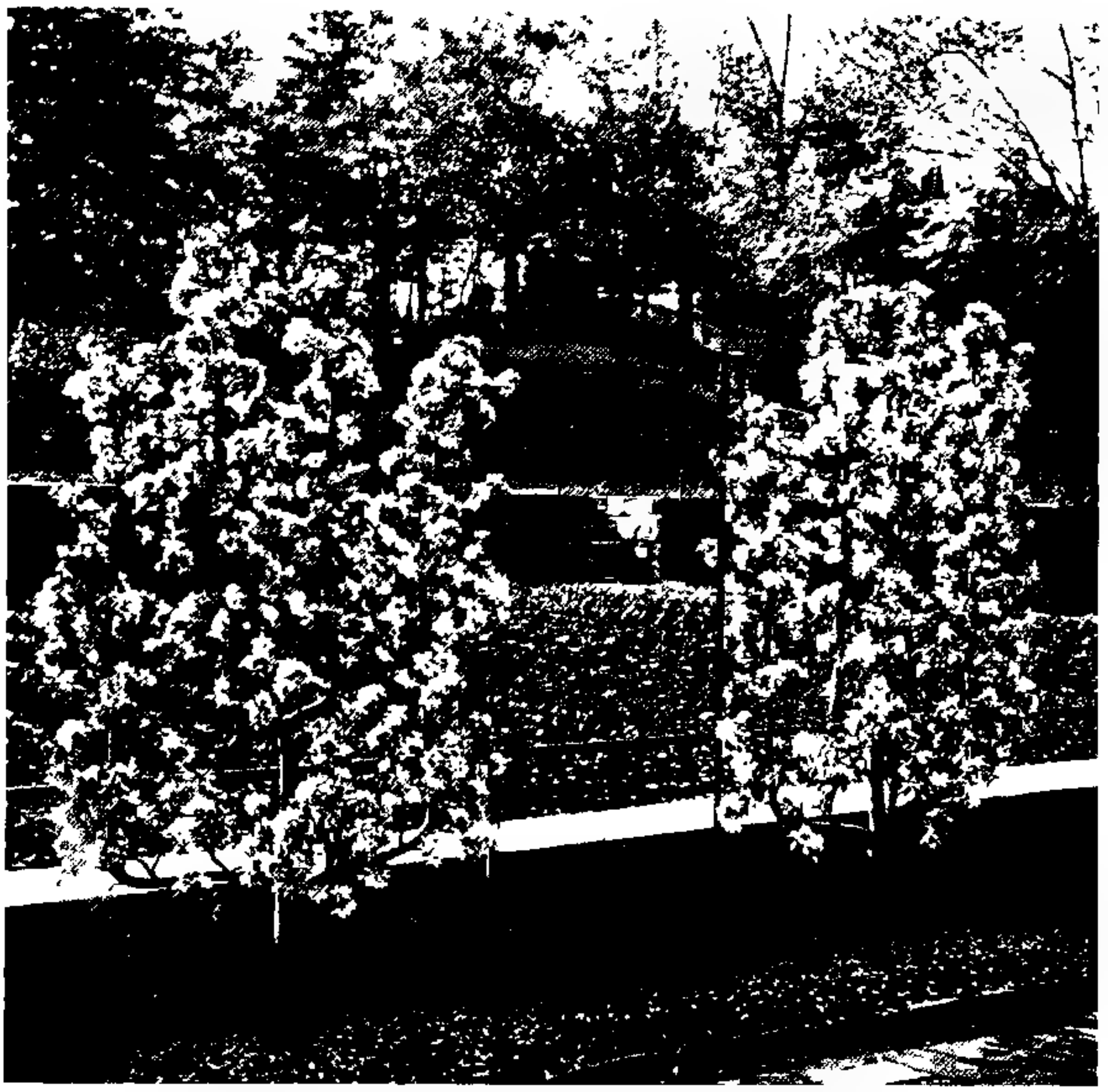
A tree which has been planted correctly should in a few years be ready to have its roots shortened, an operation which should then be repeated every two years. To root-prune, dig a trench around the tree about three feet away from the trunk, down to the flat stones upon which the tree was planted; to induce small fibrous roots to form, cut away all roots which have grown out that far. This confining curtails the growth of the tree to a point which, with proper pruning, lends itself to fruit-bud formation rather than to that of wood buds, which occur when growth is rank.

Espalier fruit trees require pruning in winter or early spring, and twice during summer, June and September being the months preferred. There are gardeners who prune only once during the summer, but for both appearance and bud formation, two summer prunings are better. They should consist of shortening back the new growth to four buds. This may seem harsh but it must be done to preserve the shape of the tree and to encourage fruit-bud formation. For dormant pruning—that is, pruning during the winter when the trees are in a resting state—instead of the usual thinning out, as for orchard or standard fruit trees, all growths excepting the leading branches must be pruned back to two eyes; these leaders should be shortened annually only a third of the way until the desired height has been reached. Sometimes several thin branches will develop on one shoot, and since the object of pruning espalier trees is the



Photograph by Fleda Griffith

Flowers are abundant in springtime on a tree, such as an espalier, that is regularly pruned.



Photograph by Fleda Griffith

The form of the cordon, a four-armed type, is shown in the two trees above.

production of fruit rather than of excessive wood, these should be cut away completely.* As one becomes familiar with fruit trees, fruit buds become easily distinguished from those which only cause woody growth or leaves.

As the trees age, they will no doubt make more spurs than is necessary for their good; therefore, the gardener may cut out some entirely, and

* Peaches need different treatment in the matter of pruning, especially summer pruning. The new growths which are produced from the axils of the leaves of the previous year's wood should be removed, with the exception of the strongest ones. These should be tied several times during the growing season to keep them straight, or else they will grow crooked and spoil the shape of the tree. This young wood must have the best of care, for it is this wood which produces fruit the next season, taking the place of the old fruiting wood, which must be cut out in the spring pruning. This form of growing peach trees is perhaps best adapted for greenhouse culture for the production of fruit out of its usual season. It is not to be recommended on an extensive scale for garden planting, as the trees are short-lived and their upbringing takes considerable work.

shorten back others, always bearing in mind that the shorter the spurs, the finer the appearance, for once the spurs protrude from the main stem, the beauty of the tree is lost. Of course, the grower must be his own judge of what should be removed, but he must not be afraid to prune and root-prune. Unless that is done, he cannot expect a heavy crop of fruit or an attractive tree.

Espalier fruit trees are benefited by a mulching of rotted cow manure during autumn and winter, removing what is left in the spring. A feeding of a good commercial fertilizer after the fruit has set in the spring is also recommended, for the grower has to supply the nourishment that the tree has been deprived of by the severing of the roots. Since the roots are confined to a small area, ample water should be given if the summer is a dry one, otherwise the fruit will be small and knotty. With a little practice and good common sense the gardener will soon become a good grower of dwarf espalier fruit trees.

Australian Flower Paintings Hung In Museum Building

With Chairs of Native Wood They Are A Gift From Island's Government

SIX large and colorful oil paintings of Australian flowers, a gift from the Australian Government to the New York Botanical Garden, have been framed and hung in the Museum Building during the past month. They are the work of Margaret Preston, leading painter of the flora of the island continent.

About eighty different kinds of flowers are depicted in the mixed bouquets which form the theme of each painting. Beside each one is a diagram with a key which gives the name of each flower shown. Many, such as the bottlebrush (*Callistemon*), the desert- or glory-pea (*Clianthus*), *Grevillea* and *Chorizema*, are plants which have become familiar sights to visitors in the Main Conservatories at the Botanical Garden, where they are grown and exhibited every year. Among the unique and ornamental flowers shown in the pictures are one called kangaroo paws (*Anigozanthos*), Christmas bells (*Brachycome*), and waratah (*Telopea*), which somewhat resembles a huge red chrysanthemum.

The paintings were presented to the Botanical Garden in the name of the Australian Government by Mr. L. R. MacGregor, Australian Trade Commissioner in New York. They were one of the outstanding features of the exhibit in the Australian building at the New York World's Fair during 1939 and 1940. Two of them have been hung in the Members' Room and four above the stairway leading to the library on the third floor of the Museum Building.

Eighteen chairs, each made of a different kind of native wood, were also presented to the New York Botanical Garden by Australia. They have likewise been placed in the Members' Room, where they have excited much admiration and comment. Also part of the World's Fair exhibit, these are both a practical and a valuable contribution to the Botanical Garden's collections representing the plant life of the world. The name of the wood is imprinted on each chair. Those that are used are the black bean, walnut, silky oak, white oak, silver oak, cedar, jarrah, blackwood, beech, torega, yellow walnut, maple, water gum, butt putts, silkwood, pigeon wood, butt maple and Leichhardt pine.

Plantings For Control Of River-Bank Erosion In Vermont

TO CO-OPERATE with the United States Forest Service, the New York Botanical Garden has provided the services of Dr. A. B. Stout, who for a number of years worked on fast-growing hybrid poplars for reforestation. Recently about 50 clones of poplars which were developed have been used in a river bank erosion control project in northern Vermont. The story of how the farm lands along a section of the Winooski River are being saved from flood and damage through the-assistance of the Soil Conservation Service of the U. S. Department of Agriculture is told below by the Project Manager.*

By Reuben R. Zile

WHILE erosion problems of all types are prevalent in Vermont, the question of river-bank erosion is the one that is most acute at the present time. The land-owners along the streams in Vermont are losing valuable farm land because of the cutting action of ice, frost and water.

At the request of farmers along the lower Winooski River, the Soil Conservation Service was delegated to assist in controlling river-bank erosion. After many conferences it was decided that the methods to be used must be not only effective but within the economic reach of the land-owners. One of the methods decided upon was the use of vegetation since it was noticed what a fine job nature did in various places along the river with willow, poplar, box-elder and soft or red maple.

However, on eroded banks some means was found to be necessary to stabilize the banks until such time as the vegetation could be established. Various methods of mechanical control were tried. The method finally developed calls for the use of materials most of which can be found on the farm.

Most of the control measures are confined to banks located on the outside of curves, although occasionally they are applied to straight stretches of the river. Mechanical control on such banks consists of rock riprap at the toe of the slope, coming up the bank from the bed of the river to a vertical height of approximately five feet above the summer low level of the river. Above this rock riprap a brush mat is laid to the top of the bank. This is made by first driving willow stakes about three feet long and three inches in diameter into the bank on 30-inch centers. Then willow, poplar and alder brush, the willow as a rule next to the surface, is laid between the stakes ten to fifteen inches deep. Number nine wire is then wound criss-cross between the stakes and the stakes are

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* For a report of the extent of this project see "Results of a project in hybridizing poplars" by A. B. Stout and E. J. Schreiner, in *Journal of Heredity* **24**: 216-229, June 1933.

All photographs by courtesy of the Soil Conservation Service, U.S.D.A.

Before the flood of 1936 the Winooski river bank reached as far as the line on the photograph shown above.

pounded down until the tops are level with the brush, thus tightening the wire and holding the brush down. This brush mat protects the bank until the vegetation planted can become well established. Such a mat will retain its usefulness for approximately three to four years.

Plantings of various species are made either just before the mat is laid and the bank is sloped or after the brush matting has been completed. The species used must be adapted to moist situations and it is important that those chosen will sprout prolifically following damage by ice, debris, or cutting. The following species have been used on this work: Willows (*Salix* spp.), poplars (*Populus* spp.), red-osier dogwood (*Cornus stolonifera*), alder (*Alnus*), box-elder (*Acer Negundo*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), and others. To secure establishment of this vegetation, a variety of materials has been used including new cuttings, rooted cuttings, layers, seedlings and seed.

In addition, approximately fifty clones of hybrid poplar developed by Dr. A. B. Stout have been tried on the banks of the Winooski River.

When the plantings are made before the brush mat is laid, rooted cuttings and seedlings can be used. These are planted approximately one

One year later, willows that have been planted may already be seen growing on the bank, wh.ch has been protected from further damage by a matting of brushwood held in place by wires stretched between stakes.

In 1938 another flood occurred, but the bank remained firm. The basket willows seen here have been growing for two years since the ice scoured the first year's growth. The hybrid poplars here are one year old from cuttings.

A barricade of trees and stone-filled log cribbing was used in places along the Winooski River after the flood of 1937. Instead of flowing over the farmland along its borders, the river then followed the main channel, while silt and gravel accumulated behind the tree barricade.

and one-half feet apart. In some cases seeds of alder and box-elder are scattered under the brush matting. The cuttings and seedlings are usually cut flush with the ground so that no injury will occur to them when the brush is laid.

When the plantings are made after the brush mat is in place, poplar and willow cuttings are used. A long iron dibble is employed to make the hole in the ground through the mat and the cutting is pushed into the hole until it is tightly packed. Cuttings are slanted downstream so that they will not be lifted out by ice and debris coming down during high waters. The cuttings are approximately twenty-four inches long with eighteen inches underground.

Plantings are made either in the fall or spring, depending on the work of the engineers which must at all times be integrated with the planting.

The vegetation in all cases should be kept small, not over two to three inches in diameter, so that it will be pliable and will bend under the action of the ice and water. Thus, the live vegetation will act as a living brush

mat and protect the bank from the erosive action of the water and ice. In addition, the bank will remain frozen longer under this vegetation and thus again lessen the erosive action of the high waters in the spring. The spread of the roots of the living brush mat will give added protection underground.

Another type of river erosion is channeling, the formation of new channels or chutes. These tendencies are controlled as a rule by the use of barricades. These are made up of entire trees, usually poplars and elms, piled one on top of the other until they make a stack ten feet in diameter. This pile is cabled together by one-inch wire cable and attached to three- or four-ton concrete anchors. In back of this barricade, cuttings, rooted cuttings and seedlings are planted for a distance, usually, of two hundred feet. The whole structure is permeable and tends to slow down the water so that deposition takes place behind it, thus rebuilding the bank.

At the present time approximately twenty miles of river bank have been protected by the work of the Soil Conservation Service in co-operation with the land-owners. About one percent of repair work has had to be done on the work accomplished to date.

These methods of bank protection may have some use on other streams, but before recommending their use, conditions on the particular stream on which they are to be used should be surveyed and taken into consideration.

Vegetation quickly sprang up, with the annual floods prevented. This photograph shows the same spot as appears on the preceding page.

Orchid Collection A Gift To Garden

Hybrid Cattleyas from the Garden's newly acquired collection of orchids.

NEARLY 10,000 orchid plants appraised at more than $75,000 have been presented as a gift to the New York Botanical Garden recently. The majority of the 9,572 plants are varieties of hybrid Cattleyas. They range from seedlings in flasks to fully matured and blooming specimens. The orchids are not on public display, but as they bloom in the fall and winter they will be shown in the special display houses in the Main Conservatories.

Park Commissioner Robert W. Moses is partly responsible for making it possible for the Botanical Garden to acquire this rare collection. The orchids came from the greenhouse of the late John A. Forster in Hackensack, New Jersey, and were a gift from Mrs. John A. Forster of New York City.

The New York Botanical Garden already had a collection of some 3,000 orchid plants of 700 species and varieties, including the true blue orchid of Burma and a large pure white orchid from South America. The collection is increasing in scientific and horticultural value steadily, because it is likely that some of the species in the collection will soon be unobtainable from the countries in which they grow. Excessive collecting of plants in the wild has reduced the number of specimens and has caused many countries to put restrictions on orchid plants for exportation. The newly acquired orchids give the Botanical Garden one of the outstanding public collections in the country.

"With such a wealth of plants in our greenhouses, there is a remarkable opportunity for students to undertake special studies of orchids," Dr. Robbins said in commenting on the gift. "Anyone," he continued, "interested in orchids and able to finance a fellowship for one or more students whose research work will be based on these orchids will be a benefactor comparable to the donor of the collection."

Cactus Exhibit From Mexico Presented To Garden

A LARGE collection of cactus plants, a gift of Mexico to the United States, was brought to the New York Botanical Garden Sept. 1, after a two months' display at Rockefeller Center, to be made a permanent part of the Garden's already outstanding cactus collection. The gift was officially accepted by Dr. William J. Robbins, Director of the New York Botanical Garden, at Rockefeller Center July 1.

Thanking the Mexican government in behalf of the Garden, Dr. Robbins announced that the addition of these cacti to the specimens already in cultivation at the Garden would make the cactus collection there "one of the most magnificent exhibitions of cacti available anywhere."

Because Dr. Nathaniel Lord Britton, first Director of the Garden, made an exhaustive study of this group of plants and published an authoritative monograph on them in collaboration with Dr. J. N. Rose, and because the Garden can boast of a remarkably complete collection of preserved specimens as well as of many species in cultivation, Dr. Robbins emphasized that this generous gift to the New York Botanical Garden was particularly appropriate.

Shipped in an entire refrigerator car from Mexico City, the cactus plants were replanted in the plaza at Rockefeller Center under the supervision of Mr. A. M. van den Hoek, Horticultural Director there, and Señor Augustín Gòmez y Gutierrez of Mexico City.

In his speech of acceptance Dr. Robbins brought out the interesting fact that the ground on which Rockefeller Center is standing and where the cacti were shown until the end of August, was in the beginning of the nineteenth century the site of a botanical garden known variously as the Hosack Garden, the Elgin Garden and the New York Botanic Garden.

"I feel sure," said Dr. Robbins, "that Dr. David Hosack, could he return to New York City now, would be as interested in these cacti, which occupy temporarily a part of his old garden, as in the astounding buildings which stand on the rest of it. In the name of the New York Botanical Garden and in the name of the many visitors who will come to Bronx Park to see these plants in the years to come, I say to the Mexican Government and to the people of Mexico, GRACIAS!"

Bertha Pickering

JUST before the close of the day's work on Thursday, Aug. 28, Miss Bertha Pickering collapsed without warning at her desk in the information booth in the Museum Building and died before medical aid could arrive from Fordham Hospital, only a few moments later. She was 32 years old and had been at the Garden since 1928.

As secretary to the late Dr. John K. Small, Miss Pickering had the acquaintance of botanists throughout the country with whom he corresponded. To those who were familiar with her work during those years, she was known for her painstaking reading of his manuals and other papers in proof, completing the proofreading of his "Ferns of the Southeastern States" after his death. She was originally secretary to Mrs. N. L. Britton.

From the establishment of the Taxonomic Index early in 1938, Miss Pickering was responsible for the vast job of typing and mimeographing required for this publication.

That same year she was placed in charge of the switchboard and information booth, a capacity in which she served as receptionist to the public—those persons who telephoned or came in person to ask questions as well as those having business with members of the staff. She thus became known to many thousands of persons who turned to her for their first information upon arriving in the Museum Building and who returned to her desk many times on later visits to the Garden.

Funeral services were held in Mt. Vernon the evening of Aug. 30. Miss Pickering is survived by her parents and a brother, with whom she lived in the Bronx.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Achievement in Cold-Weather Culture of Plants

WINTER FLOWERS IN THE SUN-HEATED PIT. Kathryn S Taylor and Edith W Gregg. 294 pages, illustrated with photographs, indexed. Charles Scribner's Sons, New York. 1941. $3 50

As the title of this book indicates, its prime purpose is to instruct in the cultivation of plants of a decorative character, for winter and spring flowering, in a glass-roofed pit with the sun as the sole source of heat.

One of the authors was the pioneer in her locality for this system of plant culture and describes in a very interesting way the genesis of her scheme. They also devote a most enlightening chapter to the origin and development of the greenhouse, in which are described some particularly novel features.

As regards the "pit," this is discussed in a practical and painstaking manner. Not only are detailed instructions given as to the selection of a suitable site, plans and costs of construction, operation, etc., but excellent cultural directions are provided with lists of plants suited to this style of gardening. An error crept in on page 84 where it is advised to put a crock "convex side down, large enough to cover the hole" This should read "concave."

For the person who is seeking spare time recreation, is a home body and really wants to feel that he will achieve something, this book will show the way. That part of it devoted to the lean-to greenhouse to me seems rather more than complementary as is suggested in the title page. I feel that the building and successful operation of a sun-heated pit is of itself sufficient accomplishment to warrant a work devoted to it entirely, and that the "Lean-to Greenhouse" should have been Vol. *2*.

ERWIN BECKETT.

Coal and Coal Deposits

GEOLOGY OF COAL. Otto Stutzer. Translated and revised by Adolph C. Noé. 461 pages, illustrated and indexed. University of Chicago Press, Chicago, 1940. $5.

At the time of his death Professor Noé had nearly completed his translation and revision of the second edition (1923) of the late Dr. Otto Stutzer's authoritative Kohle (*Allgemeine Kohlengeologie*). Dr. Stutzer had co-operated with Professor Noé, and had furnished revised text for some of the chapters. The whole was brought up-to-date by Dr. Noé, who also added new data on mine gasses and coal deposits in Canada and Mexico.

The text, as indicated by the title, is concerned wholly with the geology of coal and coal deposits, their physical characteristics, origin, stratigraphy, petrography and the disturbances of coal beds. Although Dr. Noé was one of our leading paleobotanists he has not incorporated any discussion of the plants which occur in association with coal deposits. While botanists will find some interesting information in the chapters on the Origin of Coal (IV) and on the Origin of Coal Beds (VI), the botanical aspects of coal are not at any time treated in detail. It is a volume of interest to geologists and of major importance to those engaged in the economic phases of the science.

H. E. VOKES,
American Museum of Natural History

Western Handbook

A MANUAL OF THE HIGHER PLANTS OF OREGON. Morton E. Peck 866 pages, indexed Binfords & Mort, Portland, 1941. $5.

Botanical manuals, it seems, must be based on political boundaries. Yet Oregon cuts right across several well-marked phytogeographic areas. However, in spite of its artificial limits, Professor Peck's work will undoubtedly be of great value to the student and to the botanical tourist.

It includes a brief essay on the "plant areas" of the state, clear descriptions and abundant keys to 3,203 species, an illustrated glossary, and an index. The work is based mainly on Peck's own very extensive collections, and is a neat job of concise presentation. In size, shape, and format it closely approximates the familiar 7th edition of Gray's Manual.

H. W. RICKETT.

Hicans, Heartnuts, and Others

THE NUT GROWERS' HANDBOOK. Carroll D. Bush 189 pages, illustrated with photographs, indexed. Orange Judd Publishing Co., New York, 1941. $1.75.

From a practical yet elementary viewpoint the author covers the numerous problems that confront nut growers throughout the country. Crop after crop is discussed, starting with the chestnut, which shows promise, and continuing through the filberts, hazels, English walnuts, black walnuts, Japanese heartnuts, butternuts, pecans, hickories, hicans, almonds, pistachios, pine nuts, acorns and chinquapins. The author gets to the kernel of each nut crop, mentioning its origin, commercial aspects, and cultivation, including planting, pests, pollination, and pruning, and concludes with a section on marketing.

RALPH PINKUS,
Arboretum Foreman.

Interpretation Of Recent Scientific Advances In Horticulture

SCIENCE IN THE GARDEN. H Bryton Logan and Jean Marie Putnam. 255 pages, pen illustrations and index Foreword by F. W Went Duell, Sloan & Pearce, New York 1941. $2.50.

The joint authors of this book, which was written in California, have undertaken a timely and worthy task the explanation of the *raison d'être* of various cultural practices of the garden upon a scientific basis and the interpretation of recent plant research in terms of garden practice and in the language of the plant grower.

The happy result is a book well stocked with information with which any up-to-date horticulturist should make himself familiar, together with material and a perspective which the scientist may find refreshing as well as useful.

Among the principal topics covered are soils, with a good practical chapter on their preparation, the use of fertilizer, etc., the handling of seeds and cuttings, insect and disease control, photoperiodism, and an appraisal of the spectacular chemicals, such as colchicine, growth substances, Vitamin B_1, and the like. A summary is presented in the form of ten simple experiments designed to demonstrate some of the more important points involved.

A few statements may be open to question: an occasional discussion, particularly of Vitamin B_1, may seem perhaps a little over-enthusiastic, but in general both sides of a topic are very fairly presented. Provided that the reader has both feet on the ground at the start and determines to keep them there, he will discover much interesting information which at the same time may be often new and useful.

HENRY T. SKINNER, *Curator,*
Morris Arboretum, Philadelphia.

A Science Popularized

THE ADVANCE OF THE FUNGI. E. C. Large 488 pages, illustrated with diagrams and photographs; bibliography, index. Henry Holt & Co., New York, 1940 $4

The Advance of the Fungi is an attempt to popularize a science of which the layman, for the most part, knows little Much like the work of de Kruif in bacteriology and medicine, this book treats of plant pathology, its rise from modest beginnings in 1845 to its important position in 1939, discusses the conflicts between early botanists, and tells of the misery caused by fungal ruination of food crops upon which depended human life.

Mr. Large is a careful and accurate writer. For the most part the style is good and the book reads easily, except where, obviously a fictionist, the author obscures his purpose by circumlocutions and emotional explanations of political issues, technical terms, and personalities that are extraneous.

For the professional plant pathologist the book is of little value. However, for general consumption by the public it serves a purpose in focusing attention on a science whose song has not too often been sung.

RUTH ANN BOBROV.

Books For Young Botanists And Gardeners

OUR PLANT FRIENDS AND FOES. William Atherton DuPuy. 280 pages, illustrated, indexed. John C Winston Co., Chicago. 1939. 80c.

An entertaining book written especially for young people, telling of some of our edible and otherwise useful plants, also of their poisonous relatives. It contains the occasional inaccuracy often found in popularized versions of science, such as referring to certain bacteria as insects, but on the whole it gives the facts as they are.

GARDENING FOR YOUNG PEOPLE. M. G. Kains 280 pages, illustrated, indexed. Greenberg, New York. 1941. $1 50

A book for youthful gardeners written by a man who has been a gardener since the age of five.

OUR COUNTRY'S NATIONAL PARKS. Irving R Melbo. 2 volumes, 244 pages each, illustrated with photographs and indexed. Bobbs Merrill, Indianapolis. 1941. $2 each.

Two attractive volumes especially prepared for young people who, through such books, can enjoy learning about the beauty spots of their country which have been set aside as national parks.

BOTANY. Robert F. Lane. 66 pages, illustrated with photographs and indexed. Boy Scouts of America, New York.

A pamphlet giving Boy Scouts the information required for obtaining a merit badge in botany.

On Plants Of Commercial Importance

TEXTILE FIBERS AND THEIR USES. Katharine Paddock Hess. 530 pages, illustrated with photographs, indexed. J. B. Lippincott Co., Chicago. Third edition, revised, 1941. $3

Synthetic fibers make plants of even greater importance than formerly as producers of the materials for cloth. This book, which is in three sections, deals first, technically, with textile construction, finish, and design; second, with textile fibers of every kind—wool, silk, cotton, linen, and synthetics; and third, with textiles and the consumer, giving directions for the selection of materials and their care.

THE DISEASES OF THE COCONUT PALM. H R. Briton Jones, revised by Ernest Entwisle Cheesman. 176 pages, illustrated with photographs, indexed. Williams & Wilkins, Baltimore. 1941. $3 50.

The importance of the coconut palm as a commercial product makes a study of its diseases and pests of international importance. Thirty-seven photographs, including a frontispiece in color, illustrate the book. There is a bibliography of 250 titles.

CORK AND THE AMERICAN CORK INDUSTRY. Arthur L. Faubel 151 pages, illustrated with photographs, indexed. Cork Institute of America, New York Revised edition, 1941. $1.50.

A fascinating story of the cork oak and its uses, with an abundance of good photographs.

COTTONSEED AND ITS PRODUCTS. 35 pages National Cottonseed Products Ass'n., Memphis, Tenn. 1941.

A paper-covered booklet designed to encourage the greater use of products made from cottonseed.

EUROPEAN GRAPE GROWING. Virgil J. Rittich and Eugene A. Rittich. 93 pages, illustrated, indexed. Burgess Publishing Co., Minneapolis. 1941 $2 25.

Growers of grapes in the northern parts of the United States and Canada should be aided by this book, which describes methods of culture in European regions where winter protection is necessary.

THE MANUAL OF MUSHROOM CULTURE. Raymond G Rettew, Otis E. Gahn, and Floyd W. Divine 189 pages, illustrated with photographs and indexed, a separate section for keeping records Chester County Mushroom Laboratories, West Chester, Pa. Third edition, 1941.

A history and complete description of the commercial culture of mushrooms, including diseases and pests and their control.

Phases Of Agriculture

FARM OWNERSHIP, TENANCY, AND LAND USE IN A NEBRASKA COMMUNITY. Robert Diller. 192 pages, illustrated with diagrams, indexed. University of Chicago Press, Chicago. 1941. $2.

A Nebraska community taken as an example for a study of land ownership in a typical western farming community. The work was sponsored by the Raymond Fellowship at the University of Chicago. This is a study which cannot be passed

over lightly by anyone who feels concern for sociologic and economic trends in America.

FORESTRY IN FARM MANAGEMENT. R. H Westveld and Ralph H. Peck. 339 pages, illustrated with photographs, indexed. John Wiley & Sons, New York. 1941. $3.

A subject of increasing importance in these days of conservation and the trend toward "going back to the farm." Advantages of having trees, practical points on their care, and ways of making profit from them are told.

FARM SOILS, THEIR MANAGEMENT AND FERTILIZATION. Edmund Worthen. 515 pages, illustrated with photographs, indexed. John Wiley & Sons, New York. Third edition, 1941 $2.75.

Results of recent investigations with soils, carried on largely by government agencies, are included in the new edition of this volume, giving the agriculturist a scientific basis for some new practices in the handling of soil.

Bicentennial

CONSERVATION OF RENEWABLE NATURAL RESOURCES. Raphael Zon and others. 200 pages, illustrated with diagrams. University of Pennsylvania Press, Philadelphia, 1941. $2.50.

Twelve speakers at the Bicentennial Conference at the University of Pennsylvania tell their versions of how the natural resources of the country can be kept from disappearing.

CYTOLOGY, GENETICS AND EVOLUTION. M. Demerec and others. 168 pages, illustrated with diagrams and tables. University of Pennsylvania Press, Philadelphia. 1941. $2.

A dozen papers from one section of the Bicentennial Conference of the University of Pennsylvania are presented, mostly with illustrations, charts and bibliographies. The authors are Demerec, Metz, Schrader, Blakeslee, Dobzhansky, McClung, Jennings, Diller, Sonneborn, Churney, Duryee and Henshaw.

New Editions

PLANT GROWTH SUBSTANCES. Hugh Nicol 148 pages, illustrated with photographs and indexed. Second revised edition. Chemical Publishing Co., Brooklyn, 1941 $2.

A new edition of a book originally published by Leonard Hill in London, dealing with the chemicals that induce more active growth in plants and how they may be used. Much new material has been added and several chapters have been rearranged. Originally reviewed in this Journal in October 1938.

COMMERCIAL FERTILIZERS. Gilbeart Collings. 480 pages, illustrated with photographs and indexed. The Blakiston Co, Philadelphia. Third edition, 1941. $4.50.

Colored illustrations showing the effect of chemical deficiency in plant nutrients have been added to this new edition of Dr. Collings' work. The second edition was reviewed in this Journal in August 1939

COMMERCIAL FLOWER FORCING. Alex Laurie and G. H. Poesch. 565 pages, illustrated with photographs and indexed. The Blakiston Co., Philadelphia. Third edition, 1941. $4.50.

Experiment and research are bringing new chapters into many new editions of books. Culture of greenhouse crops in gravel with chemical solutions is one of several subjects which have been added to the third edition of this standard work for florists. The original edition was prepared in 1934 by Alex Laurie and L. C. Chadwick, both of Ohio State University.

TEXTBOOK OF BACTERIOLOGY. Edwin O. Jordan & Wm. Burrows. 731 pages, illustrated with photographs, indexed. W B. Saunders Co., Philadelphia Thirteenth edition, 1941. $6

Beginning 150 years before Van Leeuwenhoek with Fracastorius' "contagium vivum" as a cause of disease, the 13th edition of this text book carries investigation of bacteria down to 1941. with Bengston's discussion of nine-mile or "Q" fever in recent Public Health Reports.

Scientific Adventure

ADVENTURES IN THE PLANT-DISEASE WORLD. Howard S. Fawcett. 34 pages, illustrated with photographs and several diagrams. University of California Press, Berkeley. 1941. 50c.

It is seldom that a scientist looks at scientific work as the adventure that Dr. Fawcett confesses it is. His Faculty Research Lecture of 1940 at the University of California makes this story of plant disease research as good as a detective tale without getting away from the facts of plant life.

Autumn Lectures At The Garden

THE Botanical Garden's own motion picture, double its former length, will be used this year to open the autumn series of Saturday afternoon lectures. It will be given in the Museum Building at 3 p.m. Sept. 20. The complete schedule for the season follows:

Sept. 20 ***The Botanical Garden from Spring to Spring***
A Motion Picture in Color

Sept. 27 ***Autumn Colors—Why and Where They Appear***
A. B. Stout, Curator of Education and Laboratories

Oct. 4 ***Flower Photography in Color***
Paul Rittenhouse, Amateur Photographer

Oct. 11 ***Wild Fruits and Flowers of Autumn***
E. J. Alexander, Assistant Curator

Oct. 18 ***Plants and the Course of Civilization***
W. H. Camp, Assistant Curator

Oct. 25 ***Soils and Composts for the Garden***
T. H. Everett, Horticulturist

Nov. 1 ***Dye Plants of the American Indians***
G. L. Wittrock, Custodian of the Herbarium

Nov. 8 ***Plants -The Struggle to Survive***
H. Beaman Douglass, M.D.

Nov. 15 ***Floral Adventures in the Pine Barrens***
John Gill, Introduced by *Mrs. Allan Marquand*

Nov. 22 ***Winter Protection for the Garden***
J. H. Beale, Superintendent of the Arboretum, Boyce Thompson Institute

Nov. 29 ***Peloponnesian Wanderings***
Prof. and Mrs. Clarence H. Young

Dec. 6 ***Nature Study in Winter, with Bird Songs***
William C. Wheeler, Trailside Museum, Poundridge, N. Y.

Dec. 13 ***Flower Arrangement for the Beginner***
F. F. Rockwell and Fredrick W. Cassebeer

Montreal And New York Botanical Gardens Exchange Student Gardeners

THE FIRST student gardener to come to the New York Botanical Garden from Montreal on an exchange that has recently been effected with the Montreal Botanical Garden arrived August 15. He is Paul Gagnon, who has been employed at the Canadian institution for two years. He is to continue his training for one year at the New York Botanical Garden, attending classes in the Science Course for Professional Gardeners and working daily as a member of the gardening force.

Leonard Kline, who has been at the New York Botanical Garden as an apprentice since February 1941, went to Montreal in a similar capacity last month. Traveling expenses of both of the students are being paid by the National Association of Gardeners.

The exchange arrangements with Kew Gardens in England, established in 1936, and with the Royal Botanic Garden in Edinburgh, begun in April 1939, were both temporarily discontinued in the fall of 1939, because of the international situation. This new exchange with Montreal is the first opportunity that has been offered for gardener training in another country since the beginning of the war.

Notes, News, and Comment

Art Exhibit. More than fifty water-colors of the sub-tropical flowers that grow in Florida are contained in an exhibit that will continue to be shown in the Museum Building until Oct. 12. Wilhelmina Freeman Greene of Winter Park, Fla., is the artist. Colored reproductions of about 20 of her paintings, mounted on folders and accompanied by envelopes, are on sale at the information desk for the benefit of Bundles for Britain.

Research. Dr. E E. Naylor, Assistant Professor of Botany at the University of Missouri, spent nearly four months at the Garden, making further studies on vegetative propagation for his forthcoming book, "Regeneration in Plants."

Fellowship. Dr. Thomas Laskaris, who has been working at the Garden for the past two years on diseases of *Delphinium,* has accepted a fellowship at the Rockefeller Institute for Medical Research at Princeton, N. J., in the laboratory of Dr. L. O. Kunkel, beginning September 1.

Summer Students. Miss Ethel Welti was the recipient of a summer scholarship at the Botanical Garden and has been working for a month with Dr. A. B. Stout in research with *Hemerocallis.* This scholarship was derived from the special Hemerocallis fund.

Among the volunteer research students and investigators during the summer are Mr. Bernard Goodman, who has been working on the chemistry of flower pigments of daylilies; Mrs. Anita G. Appell, doing research work in *Hemerocallis* with Dr. Stout; Miss Ruth A. Bobrov and Miss Grace Antikajian, doing research in pathology with Dr. Dodge, and also Dr. James Merry of Dennison University in Ohio, who has been spending several weeks in Dr. Robbins' laboratory. Other volunteer workers include Miss Lillian Camire, a student from Trinity College, Burlington, Vt., in the library and Miss Nirvana Alichania, a Hunter College student, who has been working in the editorial department.

Student Gardeners. Vincent Walsh, student gardener, has been assigned to the Plant Pathology department to work with Dr. B. O. Dodge in the culture of delphiniums for disease and pest control.

David Melrose, student gardener at the Botanical Garden, left August 13 as a volunteer in the United States Army.

Honor. Mr. E. J. Alexander has been made an honorary member of the American Rock Garden Society. Among its other honorary members are Lord Aberconway of North Wales, Sir Frederick and Lady Moore of the Irish Free State, and the Viscountess Byng of Essex, England.

Visitors. A number of botanists, horticulturists, students, and travelers took advantage of the end of the summer vacation period to stop at the New York Botanical Garden.

Rolf Santesson of the Naturhistoriska Riksmuseum of Stockholm, Sweden, came during August to study lichens on his way home after two years in South America.

Dr. Stuart M. Pady, Professor of Botany at Ottawa College, Ottawa, Kansas, who is working at present on spruce and fir rusts, called at the Garden recently to consult various members of the staff and to work in the herbarium. Dr. Pady formerly worked at the Garden on a National Research Council Fellowship under Dr. Dodge.

Dr. and Mrs. G. K. Parris of the Department of Plant Pathology in the Hawaii Agricultural Experiment Station at Honolulu were also at the Garden during August. Dr. Parris, who has been working on common plant diseases of the islands, is on a year's sabbatical leave and joins Dr. C. M. Tucker in the fall at the University of Missouri to continue work in Plant Pathology. Mrs. Parris, the former Margaret Almstedt, is a graduate in botany from the University of Missouri.

J. M. Pagán of Rio Piedras, Puerto Rico, and J. T. Baldwin, Jr., of Ann Arbor, Mich., visited the Garden on Aug. 22. Dr. Pagán returning from a year at Michigan on an exchange professorship

Other August visitors included Roger Gauthier of the University of Montreal; Florence Rhudy, Riverside, Calif.; Mr. and Mrs. William M. Baird, Jr., and Ann Louise Baird from Chairyung, Chosen; J. M. Poehlman of the University of Missouri; Dr. Manuel Díaz, Professor of Natural History in the Official High School in Havana; C. K. Tseng of the University of Michigan, who is studying algae; Dr. Lawrence White of Harvard University, and Dr. Wan-Sen Lo of China.

On Sunday, August 17, Mr. W. Ray Hastings, Executive Secretary of the All America Selections, Mr. H. A. Joy of the Ferry Seed Company, Detroit, and Mr. Fred Herbst of Herbst Bros., New York, visited the library and inspected the trial border of annuals.

Professor Marie-Victorin, Director of the Montreal Botanical Garden, was at the Garden in late July.

Lectures and Field Trips. Summer activities of members of the staff and others associated with the Garden have included a number of lectures and field trips, as well as appearances with the Garden's motion picture, as listed below.

Miss Elizabeth C. Hall lectured on "Summer Reading for Gardeners" at the Flushing Garden Club on August 13. On June 1 she was leader of a Torrey trip to Smithtown, L. I.

On July 11 Mr. T. H. Everett spoke on horticultural practices before the Westport Garden Club, and on August 8 he again addressed the group, discussing propagation.

Dr. H. N. Moldenke lectured on "Plants of the Bible" August 25 at the Nathan Hale Garden Club at Huntington, L. I. His talk was illustrated with water-color pictures made by the W.P.A. at the Garden, and also with twelve photographs, most of which first appeared in the March Journal. Field trips that have been under Dr. Moldenke's direction include a Torrey Club trip to the Nathan Straus estate at Valhalla, N. Y. June 29, besides an earlier trip of the New World Club for the benefit of European refugees.

On Aug. 24 Mr. E. J. Alexander conducted a Torrey Club trip around Montauk Point; Dr. William J. Bonisteel led a trip into the Catskills in late July; Mr Robert Hagelstein conducted a search for myxomycetes on Long Island June 29; and Dr. Ellys T. Butler was guide on the club's journey to northern Vermont the first of June.

Movie. The motion picture of the Botanical Garden was presented by Dr. William J. Robbins on July 30 before the Bedford Farmers' Club and on July 31 by Mr. T. H. Everett before the National Association of Gardeners, whose meeting was held at Mrs. Mark S. Matthews' estate at Rye, N. Y. The movie was repeated on August 12 in the Members' Room where Mr. E. J. Alexander presided at its showing before the Garden Chapter of the Women's Club of Forest Hills, of which Mrs. Carl S. Noble is chairman. The club spent the day at the Botanical Garden visiting mainly the outdoor plantings and the Museum Building under the guidance of members of the staff.

Current Literature At a Glance*

Addisonia. The 1941 issue of *Addisonia,* which was distributed to members of the Garden early in the summer, contains colored plates and descriptions of *Pyrrheima fuscata,* a red-haired spiderwort from Brazil; *Jussiaea diffusa,* an aquatic creeper of the Evening Primrose family; *Brodiaea capitata,* the "Blue Dicks" of the West; *Cyrtanthus Mackenii* var. *Cooperi,* yellow ifafa lily from South Africa; *Crataegus Harbisoni,* a haw from Tennessee; *Dendrobium chrysotoxum,* a Burmese orchid; *Gardoquia coccinea,* scarlet calamint from the Gulf Coast; and *Streptocarpus Rexii,* a gesneriad from South Africa. E. J. Alexander, T. H. Everett, Joseph Tansey, and J. G. Esson are the authors of the descriptions.

Better Lawns. "Control of Lawn Weeds and the Renovation of Lawns" is the title of Bulletin 619 of the Agricultural Experiment Station at Wooster, Ohio. Photographs illustrate the 85 pages of text.

Colorado Weeds. Each plant is illustrated with a drawing in the 125-page booklet, "Weeds of Colorado," issued as Bulletin 466 of the Experiment Station at Fort Collins, Col.

Old Roses. Forty "favorite varieties" of old-fashioned roses are selected for brief descriptions in the July *Bulletin of Popular Information* of the Morton Arboretum, which has a planting of more than 284 varieties on its grounds at Lisle, Ill.

Delphinium Year Book. Ruth Mosher Place of Detroit is the 1940 editor of *Delphinium,* the book of the American Delphinium Society. This wire-bound volume of 110 pages contains, besides news of the society, sections entitled In the Hardy Border, Hybridizers and Breeders Speak, From the East and the West, Landscape Possibilities, Delphiniums in Arrangement, and Culture and Method, which includes an extensive report by Thomas Laskaris on the work he has done at the New York Botanical Garden on crown rot and other diseases affecting *Delphinium* species.

Fungicides for Orchids. A report on effective fungicides for orchids is given in the May 1 number of the American Orchid Society Bulletin by Arthur G. Kevorkian and Claud L. Horn. The experiments on disease control were conducted by the U.S.D.A. at Mayaguez, Puerto Rico.

* All publications mentioned here—and many others—may be found in the Library of the Botanical Garden, in the Museum Building.

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To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Robert H. Fife, Chairman; Mrs. Elon Huntington Hooker, First Vice-chairman; Mrs. Carl A. de Gersdorff, Second Vice-chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

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CAROL H. WOODWARD, Editor

OCTOBER 1941

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EDUCATIONAL PROGRAM

With around two hundred students registered in the courses of study which have commenced since September 23, the New York Botanical Garden's place as an educational institution is clearly recognized by the public. In the fields for which it is especially fitted to give instruction, by virtue of its plantings, the wild wooded areas, the herbarium, museum, and specialized library, as well as the scientific training of members of the staff, the Garden holds a position of first rank. The courses being offered have been designed to meet the specific desires and needs of former and prospective students.

Nearly half of the men and women registered this fall are enrolled for the class in Fundamentals of Gardening, which serves as one of the six terms of study in the Two-year Course in Practical Gardening. More than a quarter of them, including the Garden's own student gardeners, are taking two subjects offered in botany as part of the Two-year Science Course for Professional Gardeners. Garden Management, a new afternoon course for home gardeners, Planting the Home Grounds, an evening course that was also introduced this fall, and Field Botany, a Saturday course in the identification of the plants that grow wild in the vicinity of New York, are attracting around a score of students each, many of them persons who find in these courses at the New York Botanical Garden the opportunity for study that they had been seeking.

Other old and new courses are scheduled to start in the months to come, further meeting the public's demand and helping to fulfill one of the original stated purposes of the Garden—to afford instruction in botanical science and kindred subjects.

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Winter Protection Of Shrubs

By J. H. Beale*

IN MANY GARDENS a recurring problem is the adequate protection of evergreen and deciduous shrubs that are susceptible to winter injury. To attempt to indicate which shrubs are to be considered tender is impractical, for quite frequently some that require protection in one garden will come through, winter after winter, without such care in another garden at no great distance.

If previous experience of conditions to be expected in a region is lacking, many factors must be taken into consideration. These include exposure, elevation, type of soil and its water-holding capacity, and natural protection or the lack of it. Many gardens, or parts of them, which at first glance appear to be ideally sheltered prove to be merely frost-pockets where only the hardiest plants manage to survive the winters unharmed. There are people who still fail to realize that air drainage is almost as important as soil drainage and equally to be considered when selecting positions for "borderline" plants. A great deal of winter injury is caused by planting in unfavorable exposures. Common hemlock, for example, may be severely injured and is sometimes killed when fully exposed to northwest winds; and Japanese andromeda may have an abundance of flower-buds when winter sets in, but all of them may turn brown and drop in early spring if it does not have some slight protection from the full power of the sun. It is also probable that the susceptibility of all plants is increased following a mild, wet period in late autumn when their tissues fail to ripen. Severe insect infestation during the previous growing season has similar results.

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* Mr. Beale is Superintendent of the Arboretum at the Boyce Thompson Institute in Yonkers, N. Y., where he has had the care of many thousands of fine trees and shrubs for the past 11 years. He is also on the teaching staff of the New York Botanical Garden, being scheduled to give a portion of the Three-Day Short Course in Practical Gardening for the second time next April. On Nov. 22 he will lecture at the New York Botanical Garden on "Winter Protection for the Garden," in this talk including cold-weather care of herbaceous perennials as well as woody plants.

A shrewd observer has remarked that there is no such thing as an average winter, and experienced gardeners will agree with this opinion, at the same time taking precautions against what they fondly hope will be nothing worse than the average winter of their imagination. Winters of such severity as those of 1916-17 and 1933-34 are always likely to upset the best laid plans, but fortunately they are rare. Much more frequent are longer or shorter periods of high, cold wind, or of severe frost in late winter as the sun climbs higher and becomes increasingly powerful each day, and it is at this time that the greatest amount of winter injury occurs, though it may not be obvious until some weeks later. The spring of 1941 brought many complaints of injuries to rhododendrons and, more surprisingly, to many of the commoner forms of American arborvitae among other conifers. There can be little doubt that these were due to the continued high winds of March at a time when the ground was frozen and the plants were therefore unable to replace through their roots the moisture lost by excessive transpiration from their leaves.

As it is impossible to foretell how severe a winter will be it is wisdom to prepare for conditions of some stringency, at least so far as more favored plants of doubtful hardiness are concerned. The three needs to be particularly met are protection from cold winds, bright sunshine, and rapid fluctuations of soil temperature. With these provisions made, a period of steady cold is least to be feared. A good cover of snow is the finest form of protection, but in this region it is too fickle in its appearances and disappearances to be depended upon, added to which it does not supply needed protection for the tops of such plants as stand above it. A mulch directly over the area occupied by the plant's roots is undoubtedly one of the most important aids, its purpose being to prevent deep freezing as well as alternate freezing and thawing of the soil. A mulch which loses excessive moisture rapidly provides better insulation against changes of soil temperature than one which retains moisture. A further advantage is its influence in preventing early spring growth that might be injured by later frosts, for the soil below it does not thaw until increasingly mild weather indicates that the worst of the winter has passed.

The Best Kinds of Mulch

A number of materials are used for mulching, among them salt-hay, straw, leaves, peat-moss, cranberry stems, pine needles, and glass-wool. Barnyard manure is frequently used and when it contains a large amount of straw is reasonably satisfactory for deciduous shrubs, but at best it tends to retain too much moisture, particularly when the straw is much decayed. Meadow-hay should be avoided as it introduces quantities of grass and weed seeds into the garden. It is true that oak leaves mat down less than others, nevertheless, leaves of all kinds must be regarded as one of the least

desirable mulching materials. Pine needles are much to be preferred as they remain porous, a quality that is shared by cranberry stems. Glass-wool has proved to be one of the best materials, but its cost rather limits its use. The coarser materials enumerated should be used to a depth of four inches, except that half this thickness of barnyard manure or peat-moss usually suffices, and glass-wool may be used in a single layer. The time at which winter protection should be undertaken is largely dependent upon locality, elevation, and exposure, but as soon as the ground may be expected to remain frozen, yet sufficiently in advance of the time when severe weather may be anticipated, is generally early enough. For a large area of the northeastern states this may be just before or soon after Christmas.

Overcoats for Favored Plants

A mulch over the roots and a single thickness of closely woven burlap over the top and sides is sufficient for many plants. Burlap should not be wrapped around evergreen plants for those parts that come in contact with the material are certain to show injury in the spring. Glass-wool, however, may be used as a wrap without injurious results. The burlap is best attached to a framework of stakes or sawn lumber made in the shape of a box or a cone and erected over the plant. When the structure has a flat top this should be reinforced with several stout cross-pieces placed about a foot apart, otherwise a heavy snowfall may cause the top to cave in with serious results to the plant. Occasionally it is sufficient to erect a screen of burlap or boards to the north and northwest of shrubs for protection from the wind. Green burlap is less conspicuous than the undyed material and may be used for several years if carefully dried and stored in a dry place at the end of the season. Board screens can be built in sections that may be handled by two persons, and the sections set end to end to provide a screen of any desired length. Sometimes, though less frequently, it is necessary to provide protection only from the sun, particularly for recently planted evergreens or for those in positions already naturally screened from wind.

Much more effective protection is obtained when the type of framework described is covered with evergreen branches such as pine, cedar, or hemlock. Spruce quickly drops its needles so is useless for this purpose. These evergreen coverings permit free passage of air, do not retain heat, and give better protection against both wind and sun than burlap. When these materials are to be used, horizontal lines of stout string or wire, 12—18 inches apart are fastened around the framework and, beginning at the bottom line, the evergreen branches are tied to them. The branches on each higher wire should overlap those on the one below, and the outer ends of the branches point downward. Straw may be used in the same

manner but it should be obtained in sheaves, as baled straw is badly broken and difficult to handle. A few lines of string passed around the outside of these coverings will prevent disturbance by wind.

Branches and Leaves for Protection

Deciduous shrubs may have the branches drawn together and tied as though in preparation for digging them up, and evergreen branches or straw may be placed upright against them and tied. For taller plants the layers of covering should overlap like shingles. When smaller plants require only partial protection and this principally from the sun, a few crowbar holes may be made around each, a branch pushed into each hole and string wrapped a few times around the bundle so formed. Another method is to enclose the plant in wire netting, with the circle extending some inches beyond the branches. The netting is supported by stakes and filled with dry leaves. As the leaves are put in they should be pressed down to obviate later settling and the exposure of the top of the plant. The top must be covered with roofing-felt, old linoleum, or any similar impervious material that will prevent soaking of the leaves by rain or melting snow. Dry leaves absorb heat or cold very slowly and driving rain will not penetrate them for any considerable distance if they have a waterproof covering.

An open-topped barrel or box filled with leaves and covered with burlap is the least desirable form of protection for it is not long before the leaves are water-soaked. Decay of some of the stems is the least that can be expected from repeated freezing and thawing of the mass of wet leaves in contact with the stems. However, if it becomes necessary to cover a plant with a box or barrel, the top should be waterproof and a number of holes should be bored in the sides to admit some air, the holes to be covered with quarter-inch netting or wire screen to keep out mice. The most serious objection to such tight coverings is the likelihood that the plants will be forced into growth before it is safe to uncover them.

A method of protection that must be regarded as still in the experimental stage is the use of liquid preparations of wax or rubber. These are applied with a garden spraying machine, and after the water in the material has evaporated a thin film of the substance is left on leaves and stems. At present, reports of users show differences of opinion as to their protective value, but on account of their ease of application they are worth trying on a limited scale.

Winter Homes for Rodents

Most methods of plant protection also afford protection for mice, a fact that may not be realized until some prized shrub has been ruined by them. The soil beneath a mulch that is spread before the ground is frozen may

be riddled with tunnels in which mice pass the winter feeding on the roots and collar of the plant; and packed, dry leaves afford most desirable quarters for them. The mouse population seems to be very little reduced by trapping. The most effective control is obtained by using poisoned wheat. A dozen or more grains may be placed in a 3—4 inch drain tile, or in a metal food container that has had holes an inch in diameter punched in bottom and lid. Either form of container is placed near the stems and below the mulch, but when the plants are uncovered in spring it is necessary to gather and destroy all grains that are left, for if carelessly thrown aside they will soon poison the birds.

Gigantic Stapelia Blooms In Member's Greenhouse

TWO plants of *Stapelia gigantea,* the flowers of which rank among the largest in the world, came into bloom in late September and early October in the private greenhouse of Victor Greiff at Neponsit, Long Island.

Mr. Greiff, who cultivates unusual plants as a hobby, is a member of the New York Botanical Garden.

About two years ago he acquired one plant of this stapelia from a grower of succulents. During the first year he kept it on an enclosed porch, then when he built a greenhouse he transferred it there. He has kept it growing in a very rich porous soil with several other succulents (*Euphorbia, Kalanchoë, Echeveria,* and *Aeonium*) in a well drained pan.

The first flower appeared on a new plant arising from a runner which had crept over the side of the pan and rooted itself in the wet sand of the bench. Thus it showed its appreciation for an ample supply of moisture at blooming time, Mr. Greiff pointed out. This new plant, which had developed a tremendous root system and had become plump and vigorous from the moisture and sun it received, has now been separated from the other and potted up by itself.

"During the development of the buds," Mr. Greiff explained, "the greenhouse was cleared of all material except the cacti and other succulents, and the temperature was allowed to go up to 110 in the daytime and kept at 75 or above at night. The plants were allowed full sun and, while they were well watered, they were not too thoroughly ventilated, in order to conserve humidity."

Early in October, when the outdoor temperature became exceedingly hot he wrote: "Several buds are in development on both the old and new plants, particularly on the young growth of the old one, though some of

them have aborted. The others are opening daily, but those that come out in a lower temperature are much smaller and the corolla lobes become strongly revolute and reflexed. As the heat increases the flowers again become larger.

"As soon as the temperature passes above 90 degrees, the odor becomes very strong and carrion flies come in great numbers from outside to lay their eggs within the putrid-smelling flowers."

The color of Mr. Greiff's stapelia, the first flower of which he brought to the New York Botanical Garden to verify its identity, was characteristically pale greenish yellow with irregular but concentric streaks of brownish purple. It measured 19 inches in diameter. While it can scarcely be compared with *Rafflesia* of the Sumatran jungle, single flowers of which are frequently 3 feet across, it is on a par with *Aristolochia grandiflora* of Jamaica, with *Victoria regia* as it is known in the rivers of South America, and with *Magnolia macrophylla*, the cucumber-tree of southeastern United States, all of which have flowers of similar breadth. The krubi (*Amorphophallus titanum*), of which the Garden has brought two specimens into bloom in recent years, is in a different class, for what is commonly called the flower is really an inflorescence consisting of many separate flowers.

Except for *Rafflesia*, few plants are known in the world with an individual flower as large as *Stapelia gigantea*.

One of Mr. Greiff's stapelias, showing several buds as well as a medium-sized flower.

The Caballero Daylily

IN THE JOURNAL of The New York Botanical Garden for January of this year a daylily with bicolored pattern was described under the name "Harlequin." It has been learned that this name had previously been applied to another daylily. Hence the name for the particular daylily described in the Journal of January 1941 has been changed to ***Caballero***, and persons who have already obtained divisions of it from the Farr Nursery Co, are being notified of the change. The use of the same name for two different horticultural clones leads to confusion and is certainly to be avoided whenever possible.

A. B. STOUT.

The Flora Of Martinique

By Henri Stehlé

This is the second article by M. Stehlé, who is a Collaborator of the New York Botanical Garden, on the plant life to be found in the French Antilles. The first, treating specifically of the flora of Guadeloupe and its neighboring islands, appeared in the Journal for February 1940. M. Stehlé is stationed at the Agricultural Experimental Station at Tivoli, Martinique. His article has been translated from the French by Adrian Van Muffling.

ALTHOUGH the Island of Martinique is not much larger than most of its neighbors in the Caribbean archipelago, its vegetation is divided into groups the characteristics of which reflect the geography of each region. The South, once very fertile, is now arid and desert-like. The central portion has the luxuriance of most low-altitude tropical forests, while the high northern section, ravaged by volcanoes and hurricanes, shows distinctive characteristics influenced by these phenomena.

The former tropical forests of the southern region were adapted to a rather dry climate, as is shown by the sparse remnants which have managed to survive. There are clusters of Antillean "pears" (*Tabebuia*); large silk-cotton trees (*Ceiba antillana*); small-leaved trees like *Eugenia*; ironwood (*Krugiodendron*); Barbados, or wild, "cherries" (*Malpighia*); "nut-trees" (*Zanthoxylum*); greenheart or snakewood, known here as MABIS (*Colubrina*); Caribbean torches (*Pilocarpus*), one of the group of plants which provides the drug JABORANDI; bonnace (or burn-nose trees) called MAHOTS-PIMENTS (*Daphnopsis*), and red-barked gum (*Elaphrium Simaruba*).

The spiny growths of Campeachy-wood (*Haematoxylon campechianum*) and acacias, which have taken the place of the original dry forests are themselves limited by the savannas. The latter are inhabited by the guava trees (*Psidium Guajava*), the fine grass locally known as MABOUYA (*Sporobolus indicus*), sometimes called hair-grass, and sugar cane. The low hills —dominated by bushes from 9 to 15 feet high, many-branched, with hard reddish wood, small drupaceous fruit and small shiny and coriaceous leaves —remind one of southern France or of the Corsican bad-lands. Their leaves, frequently tinted with red or yellow pigments, fall in the autumn just as they would in a more temperate region. Their stems, which contain colored saps and gums, are covered with protective hairs or spines, and the bark of their trunks is rough gray or brown.

In the extreme South intensive dryness and fires have caused an inroad of more decidedly desert-like vegetation, with cacti and agaves here and there supplanting the grasses and those useless malvaceous plants that are locally called "11 o'clock brooms" because they open at that hour. There one can observe plants seen also in the Sahara, such as the giant milkweed,

or silk-tree (*Calotropis*), originally native to India, and opuntias that have been carried from America to Africa. One also finds a caper (*Capparis*) called BOIS MABOUYAS; BOIS-CABRITS or "goatwood" (*Borreria*) of the Borage family; the acacia-like blackwood (*Leucaena glauca*); whitebalm or camara bushes (*Lantana*); the spiny, yellow-flowered acacias; other mimosas and their relatives with their picturesque Creole names, such as AMOURETTES or love-flowers for *Pithecolobium*; "licorice-seeds" for the poisonous crab's-eye vine or weather-plant (*Abrus precatorius*), with its long-lasting coral-colored seeds; and "stop-bull" for a spiny mimosa itself. There is the narcotic *Ichthyomethia piscipula,* used to stupefy and catch fish; *Jatropha* of the Euphorbia family, much used in the local pharmacopoeia; "wild cherries" (*Malpighia*); bloodwood or logwood, also called Campeachy wood (*Haematoxylon campechianum*); and the cat's-claw plant (*Cydista inguis*). Together these characterize the flora of this dry section. Food plants are rare and found only around habitations.

Denser Growth in the Central Region

As one leaves southern Martinique for the wetter regions of "Le Central", the character of both wild and cultivated vegetation changes progressively. Vines, ferns, mosses, and arboreal orchids become more frequent; trees are larger and lose their leaves less frequently; thickets are denser and higher and the air becomes moist and heavily scented. The fields of sugar cane are here and there replaced by mixed plantations of banana, coffee, orange, lemon, and chocolate trees. The "Creole garden" appears, containing various native and introduced plants for food and other individual uses.

Not far from the road and the cultivated land the paths disappear, and man feels small among the dense vegetation under the towering trees. The huge trunks of the local "chestnuts" (*Sloanea*); of necklace-trees called ANGELINS-PALMISTES (*Ormosia*); blue-seeds (*Symplocos*); rose-laurel (*Podocarpus*); caimito or star-apple (*Lucuma* and *Chrysophyllum*); the cursed fig (*Ficus americana*); lady-laurel or cedar-wood (*Ocotea*); and cherry-laurel (*Nectandra*); mirobalan or jack-in-the-box (*Hernandia*); mahoe, or MAHOT (*Sterculia caribaea*), and "pinewood" (*Talauma*), a magnolia relative, grow powerfully out of the soil, many of them supported by odd-shaped buttresses. Their foliage mass is barrel-shaped or horizontally spread and they all reach a height of around 100 feet. The smaller trees are cylindrical or globular, such as the West Indian currant, or CRÉ-CRÉ (*Miconia*), the local "basswood" of the Myrtle family (*Calyptranthes*), the so-called "cherries" (*Eugenia*), and mountain guavas (*Myrcia*).

The high humidity of the Caribbean forests, always close to saturation, the abundant rainfall, from 6 to 8 times as great as in the flatter and more deforested sections of the south, and finally the almost constant temperature are factors in maintaining a luxurious vegetation, typical of the

Photo by Kervégant

Cacti and acacias are often found together on arid soil where they are frequently swept by brush fires, in the extreme south of Martinique.

Caribbean region, with mosses and ferns represented in great numbers. Of the latter there are almost 300 species in Martinique alone.

The undergrowth is abundant, shrubs and suffruticose plants dominating the timid herbaceous plants and ground ferns which in turn protect the sphagnums and hepatics that cover the soil and decaying tree trunks. Branches are hidden under a mass of small vegetation and mosses or are covered with climbers, solidly attached by myriads of aerial rootlets. At every level vines occur, notably the magnificent hunter-vine (*Solandra grandiflora*) with its beautiful yellow trumpet-shaped flowers. Frequently also appear the sharply spined catgut-vine (*Smilax solanifolia*); the barrel-vine, a kind of rosewood (*Dalbergia Monetaria*), well known by woodcutters; coco-vine (*Heteropterys platyptera*), and the crab-vine (*Clematis dioica*). Real parasites, like *Phoradendron* and *Psittacanthus*, are rare in the West Indian forests, which on the other hand abound in epiphytes, especially the butterfly-orchid (*Oncidium*), the pineapple-wood (*Bromelia* relatives) with beautiful smooth leaves sometimes several yards long, as well as such aroids as *Philodendron* and *Anthurium*, the ample and cartilaginous leaves of which harbor growths of mosses and lichens.

Vegetation of the Mountain Slopes

In this vegetation pure colonies are rare except for the cannon-wood or trumpet-tree (*Cecropia peltata*), the under sides of whose leaves shine like silver in the sun; the bamboos along the rivers, trembling in the slightest wind; and tree-ferns with filigreed fronds and golden spores.

An entirely different aspect is presented on the slopes of the volcano Pelée and the peaks of Carbet. Here the vegetation changes with and is adapted to the higher altitudes. One finds mountain-thyme (*Tibouchina chamaecistus*) and terrestrial orchids (*Epidendrum Mutelianum*) indifferent to the violent winds that bow their handsome clusters of flowers; aralias (*Orcopanax Dussii* and *Didymopanax attenuatum*); fleshy-leaved mountain mangroves (*Clusia Plukenettii*) with entangled aerial roots; the tanbark of the heights (*Brysonima martinicensis*), mountain peas (*Inga coruscans*), whistling-wood (*Weinmannia pinnata*) and the useful cabbage-palm of the islands (*Euterpe globosa*).* All these plants are generally distributed in colonies and have had to adapt themselves to extreme conditions which include terrific wind storms, a rainfall of 23 to 30 feet a year, a lower temperature, and often sulphurous emanations from volcanic vents. Many species of this region are endemic to the islands.

Thus are presented, rapidly sketched, the zones of vegetation in Martinique, fashioned by the natural elements of climate and soil, on which is superimposed the intensive work of man.

Plants Used by the Earliest Settlers

From the beginning, when man first came to Martinique, he took his food and shelter from the forest. A great deal of clearing was done, especially with cutlass and fire, and the land was put under repeated cultivation. The original pre-Columbian population the warlike Arrouacs and the Caribs who came next—were already exploiting the forest to construct their CARBETS (community huts) and to make their boats, light their fires, and to seek out useful products such as the genip, which served as a dye for the warriors to color their bodies. The spontaneous vegetation gradually retreated before the plants imported by the Caribs from the mouth of the Orinoco. Such vegetables as the sweet potato, castor-oil plant, papaya, Caribbean cabbage (*Xanthosoma*) which the Arrouacs called YAUTIA, and the manioc, known as KIERE, brought by the Caribs from Guiana, were rapidly naturalized.

Later, tropical America contributed other species which were adopted for cultivation on Martinique: the avocado (*Persea gratissima*) in the end of the 18th century, from Mexico; the arrow root (*Maranta arundin-*

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* This is not the cabbage-palm cultivated in Florida, which is *Oreodoxa*, or *Roystonea, oleracea.*

Photo by Ernoult

A portion of the dense humid forest in northern Martinique, with the formidable volcano of Mt. Pelée in the distance.

acea); many decorative palms; the Spanish "lime" (*Melicocca bijuga*), a beautiful tree with a pleasant tasting small fruit; the papaya (*Carica Papaya*), native of Mexico and already under cultivation in Martinique in 1657; the passion-vine known as BARBADINE (*Passiflora quadrangularis*), as well as vanilla and tobacco. Pineapples originated in Brazil and were imported by the Caribs around 1640.

SCENES FROM THE TROPICAL FOREST OF MARTINIQUE

(Photographs by Ernoult)

Supplementary roots of a fig tree on the dry southern coast.

A tree-fern, Hemitelia grandifolia.

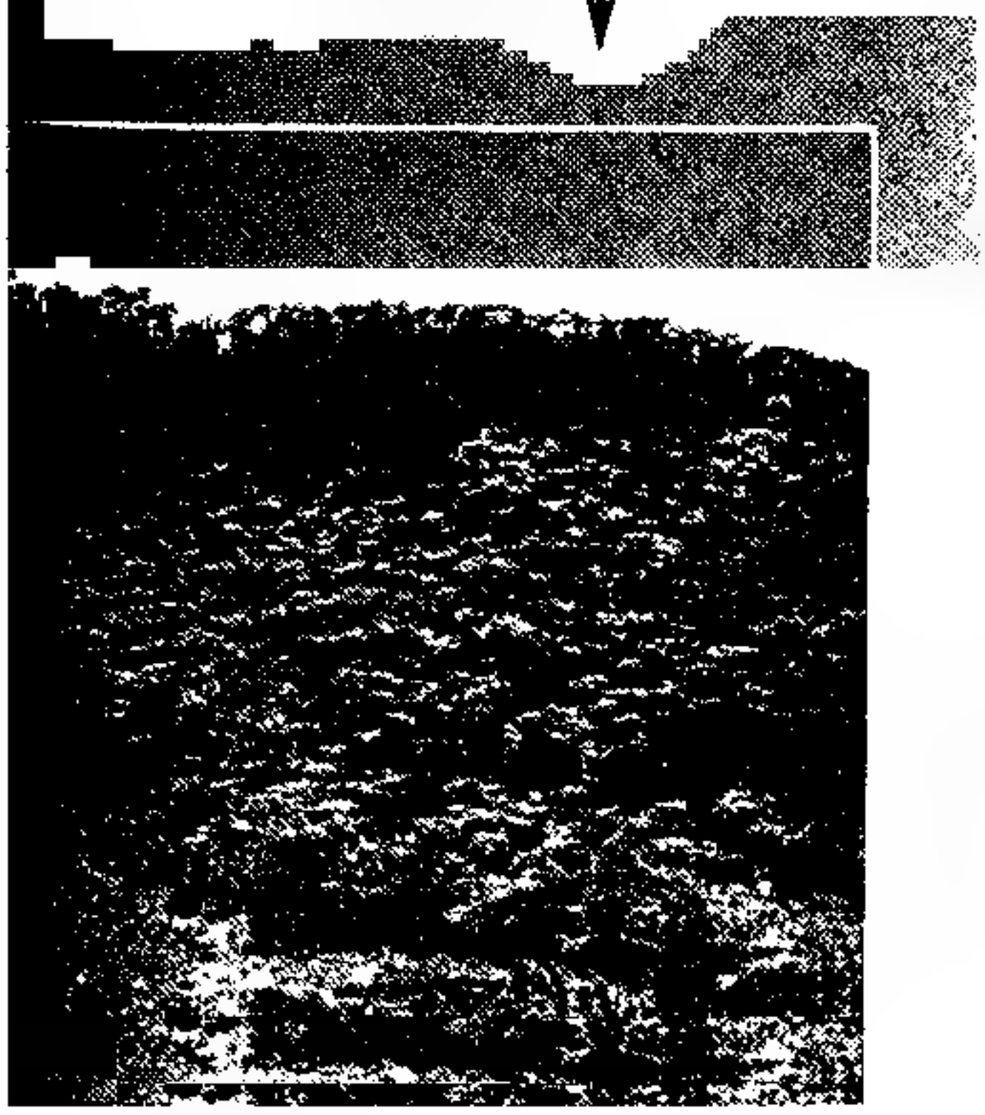
Cecropia peltata growing among numerous vines on a mud flow from Mt. Pelée which covers the rock ledges.

A leaf of Anthurium, found in the higher moist altitudes of Parnasse.

...cond-growth Bambusa vulgaris at an altitude of nearly 1,000 feet near Parnasse in northern Martinique. It grows sometimes to a height of 120 feet. →

The tropical forest is here recapturing an ancient plantation, with the help of Brugmansia suaveolens, originally imported into Martinique from Mexico for the spectacular beauty of its trumpet-shaped flowers. ←

...nse homogeneous growth of tree-ferns the slopes of Mt. Pelée. ↓



Plantation of coco-palms on the sandy shore of the island. ↓

Cultivated Crops of the White Men

The beginning of European colonization on Martinique was in 1624, when P. Gournay left Le Havre with the intent of starting a plantation of tobacco, which was then called LA PLANTE À PÉTUN or LA PLANTE À JEAN NICOT. The early white settlers who followed him soon established plantations also of the native cotton and indigo which they found there.

In 1670 sugar cane was first grown, and the crude methods of clearing the land by fire did much to destroy the soil and original vegetation. As time went on, more and more of the beautiful primitive forest disappeared, but this destruction was largely compensated for by the introduction of useful plants from all over the known world. Gradually the aspect of the landscape changed.

In 1667 Father Dutertre wrote: "When my book was first published (1654) the coco-palm was not yet known in the French Antilles, therefore I did not mention it. Now it is very common!" It was first brought by Father Diego Lorenzo in 1660 from Puerto Rico, where it had been introduced from the Cape Verde Islands in 1525. The story of when it reached there from its original home is lost in antiquity. The mango (*Mangifera indica*), native in Hindustan and Burma, was taken by the Portuguese in the early 18th century to Brazil. Thence it reached Barbados in 1750 and Martinique shortly afterward. In spite of all his troubles with the mutiny on his ship, the *Bounty*, the famous English Captain Bligh managed to bring his cargo of Tahitian breadfruit (*Artocarpus communis*) to the West Indies in 1793. He also introduced the rose-apple (*Eugenia Jambos*) from Indo-China; the Tahitian apple, (*Eugenia javanica*) which is now widespread in the West Indies, from Malaya; and from Polynesia the Otaheite apple or POMME CYTHÈRE (*Spondias cytherea*). The delicious tamarind (*Vanguiera edulis*) is a Madagascan tree which was cultivated in India whence (according to de Candolle) it was brought to Martinique in 1819. The jujube (*Zizyphus Jujuba*) and the rare and royal mangosteen (*Garcinia Mangostana*) came from Malaya; the tropical almond (*Terminalia Catappa*) originated in Asia; the shaddock (*Citrus maxima*), native of the East Indies, was naturalized in Asia and Oceania, whence Captain Shaddock introduced it to the West Indies on a voyage to England. The BIGARADIER, or Seville orange (*Citrus Aurantium*), the skin of which gives us the delicious flavor of curaçao and its flower the perfume known as neroli, was brought to us from Indo-China. Lemons were introduced to Europe in the 13th century by the Arabs and to the West Indies by the early Spanish.

From India came material which in the 17th century was already contributing products such as ginger, yams, and sesame, as well as the Angola pea (*Cajanus·indicus*), so important as a food for workers in the fields. More recently India sent the "wild cherry" (*Eugenia*), eggplant (*Solanum Melongena*), and many varieties of hibiscus and other colorful ornamental

Photo by the Agricultural Service

Lane of palm trees in the botanical garden at Tivoli, Martinique. The Experiment Station of the Colony is there, and a School of Agriculture has recently been established.

plants, most of which came from the Coromandel and Malabar coasts, among them the showy *Asystasia coromandeliana* (of the Acanthus family) and *Abutilon indicum*. The beautiful strands of bamboo along our rivers are believed to have been introduced from Asia by Governor Mahé de la Bourdonnnaye in 1747. Leechee nuts (*Nephelium Litchi*) were introduced as late as 1816.

Commercial or slave trading boats were responsible for the importation of many more plants such as the Portuguese and yellow yams (*Dioscorea rotundata* and *D. cayennensis*), the snake-plant (*Sanseviera*), cassia, red pepper (*Capsicum*), and from Madagascar the tamarind and the spectacular FLAMBOYANT or peacock-flower (*Delonix regia*).

Some plants were introduced in a roundabout way. Thus the originally Polynesian taro (*Colocasia antiquorum*) was first imported and cultivated in Malaya; later the English took it to Egypt, and from there it was in time carried to Martinique.

From Polynesia also came the breadfruit (*Artocarpus communis*), of which both the seeded and the seedless forms are grown, the nutmeg

(*Myristica fragrans*) from Molucca, and many other spices and ornamentals.

Even cold Siberia has sent us a contribution, for the well known medicinal herb *Leonurus sibiricus* has become perfectly acclimatized and flourishes in our gardens.

And finally, even old Europe, in spite of a climate two and a half times less humid than that of the Antilles, has made the useful contributions of various vegetables, of pomegranates, strawberries and the grapevine. The vines of Martinique are of royal descent, for the King's Vineyards of Fontainebleau supplied the parent stems.

All these imports have brought about a curious exoticism in our vegetative world. In this propitious soil one can see African, Asiatic, Madagascan, European, American, and Polynesian plants growing amicably together. However, a distinctly West Indian "air" has been acquired by most of them, due to necessary adaptation to local influences.

We still find in the Martiniquean littoral many autochthonous plants: the cotton plant, the Surinam apple (*Malpighia glabra*), the mammey apple (*Mammea americana*), the ICACO or coco-plum (*Chrysobalanus Icaco*), the guava (*Psidium Guajava*), apple-vine, also called water-lemon, one of the passion-flowers (*Passiflora laurifolia*), the "sweet pea" (*Inga laurina*), and the caimito (*Chrysophyllum Cainito*) and its wild prototype which we call BOUIS (*Chrysophyllum glabrum* or *argenteum*), abundant in the lower forests.

The Primitive Scene

What was the primitive forest of the Antilles like? The few specimens that remain in Guadeloupe near Rivière St. Louis and the forests of Varvotte in Martinique, between Ceron and Grand Rivière enable us to visualize what may have been its original appearance.

It was a forest of large trees from 90 to 150 feet tall, the bases of which might reach from 20 to 30 feet in diameter. They were widely spaced and only their foliage was joined, forming a canopy which allowed a sifted and diffused light to penetrate. Among them were tall papilionaceous plants such as *Dussia martinicensis*, a genus known only in the Antilles and a remnant of an archaic flora that has almost totally disappeared. These, with the tree-ferns, the powerful native "chestnuts", and the shrubby aralias gave to the forest a weird and unfamiliar appearance. The underbrush was sparse but there was an abundant in-between vegetation, consisting of large vines, orchids, mosses and delicate ferns, membranous in structure and almost transparent: plants which a slight modification of local conditions would be apt to destroy.

The virgin forest must have been very beautiful even to the Carib warriors who in days gone by shot their arrows through its shadowed aisles.

On Your Knees!

But It Does Not Pay If You Are After Dandelions

By E. E. Naylor

IF nothing else will bring a man to his knees, the dandelion will. Some try chemical eradicators and some hope the grass will look out for itself; but almost every man, sooner or later, if he has anything that pretends to be a lawn, comes to a painful progress over it on hands and knees, grubbing out the plants one by one. And the worst feature of this penance is its ineffectiveness. A few weeks later there are more dandelions than ever. Nor is this a figment of a morbid imagination. Experimental study of the dandelion shows that cutting off its head only stimulates it, like Hydra, to grow several new ones.

An explanation for the rapid re-appearance of dandelion plants is found in some recent studies made at the New York Botanical Garden on regeneration from root cuttings.*

A one-year-old dandelion plant consists largely of a thick, fleshy taproot which may extend into the ground a foot or more. The root somewhat resembles that of a carrot in shape and is richly supplied with a milky latex. The stem is very short, making up the crown of the plant—that centralized region usually just at the surface of the soil; from here the leaves and flowers originate.

When the top of a plant is removed with a hoe or sharp knife, only the stump of the fleshy root remains. This part is sometimes left exposed to the air and light, or is perhaps partly covered with soil and humus. Under either condition rapid regeneration takes place. A thin ring of a tissue known to the botanist as callus begins to develop near the center of the cut surface. This tissue continues to increase in size, until within five or six days it is covered with minute lumps that have become green. These lumps are rudimentary leaves. The characteristic unevenly toothed margins of the young leaves are easily recognized on the seventh or eighth day after the decapitation.

Detailed internal studies of the root show that on the second day growth begins in the thin-walled cells of the secondary phloem, or soft ring of fibrovascular tissue, near the central woody cylinder. This activity is sometimes found in the outermost cells at the cut surface; other times it is confined to the cells several layers below. Such leaf formation may continue for several weeks, and if the first leaves are cut away, new ones will develop and take their place. New stems are organized at the base of the leaves, and new roots originate within the parent root. Neither the age of the plant nor the position of the cut on the root appears to have

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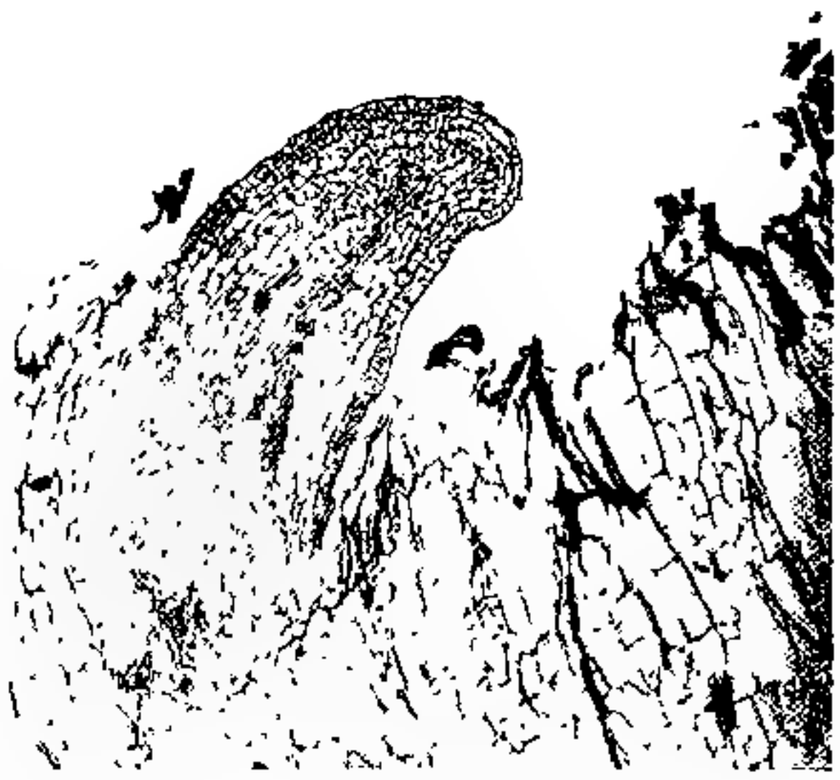
*Naylor, E., The Proliferation of Dandelions from Roots. Bull. Torr. Bot. Club. **68:** 351-358. 1941.

HOW A DANDELION GROWS IN A FEW DAYS FROM A PIECE OF THE ROOT



Upper left: The ring of callus tissue and young leaf primordia developing on the cut end of a dandelion tap-root 5 days after its decapitation. Upper right: The way the first leaf looks under the microscope at this stage. Lower left: The margins of the young leaves become visible 2 days after the photograph above. Center: Three days later, or 10 days after decapitation. Lower right: The growth made from a root cutting in 12 days.

any influence upon the development of new plants. Root cuttings placed in the dark behave like those placed in the light except for their failure to develop the green coloring.

The results of these experiments make it doubtful that dandelions can be controlled by merely cutting off their tops, for such a procedure frequently results in the development of a clump of plants where there was only one originally. Continuous knee-work, with repeated removal of the regenerated shoots will, of course, finally use up the reserve of foods in the tap-root and cause the plants to die, but very few people follow such a regular schedule of dandelion warfare. It seems safe to say that as long as there is a piece of the root alive, even if it is left on top of the ground, there is a possibility of the formation of more plants.

Perhaps the most successful method of extermination is the application of ordinary salt to the root after the removal of the leafy top, or the careful use of chemical sprays to cause the death of the entire plant without injuring the grass in the lawn.

Banker Herbarium Given To Botanical Garden

ANNOUNCEMENT of the presentation to the New York Botanical Garden of the entire herbarium of the late Howard J. Banker is made in a biography of Dr. Banker appearing in the July-August issue of *Mycologia*. The gift was made by Mrs. Banker to carry out her husband's request. The herbarium consists of 4,477 specimens, and while the majority represent the lower plants, principally fungi, there are more than 2,000 examples of the higher plants, many of them carefully and artistically mounted.

Dr. Banker was an authority on the Hydnaceae. At the time of his death on November 13, 1940, he was working on this group of higher fungi for *North American Flora*. He was 74 years old.

From the time he received his Master's degree from Columbia University in 1901 and became an instructor in mathematics, Dr. Banker was an enthusiastic mycologist. During the early years of the New York Botanical Garden, he was a well known figure about the place. From 1904 to 1914 he served as professor of biology at DePauw University, receiving a Ph.D. from Columbia in 1906 and continuing meanwhile his intensive study of the fungi. After leaving DePauw he worked until his retirement on aristogenic human heredity for the Carnegie Institution.

For many years Dr. Banker was an associate editor of *Mycologia*. He was a life fellow of the American Association for the Advancement of Science, a member of Delta Upsilon and of Phi Beta Kappa, and, for about a quarter of a century, a member of the Torrey Botanical Club and the Botanical Society of America. Most of his papers on the Hydnaceae and other fungi were published in *Mycologia* and the Bulletin of the Torrey Botanical Club.

* * *

Tapestry Booklet Published

A BOOKLET of 28 pages containing the two articles on the flora of the Unicorn Tapestries at The Cloisters in New York City, written by E. J. Alexander and Carol H. Woodward and first published in the Journals for May and June of this year, is now off the press. Published by the New York Botanical Garden, it will be sold by the Garden at 25 cents a copy. The booklet will also be handled by the Metropolitan Museum of

Art at the information desk at The Cloisters.

In addition to the two original articles, the first one being illustrated with 17 photographs of the tapestries and the second with line drawings to illustrate each of the 101 different kinds of plants that are shown, there are two additional photographs with descriptive captions included in the booklet.

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Notes, News, and Comment

Patron. Mrs. John A. Forster, donor of the gift of nearly 10,000 orchids, announced in the September number of the Journal, was elected a Patron of the New York Botanical Garden at a meeting of the Board of Managers Sept. 24.

Dedication. The John Dearness Laboratory for plant pathology, named for the eminent Canadian mycologist, was dedicated at the Montreal Botanical Garden Aug. 28. Among those present at the ceremony was Robert Hagelstein, who was returning from the foray of the Mycological Society of America held at MacDonald College, Quebec, the three days previously. Prof. Marie-Victorin, Director of the Botanical Garden, spoke of Dr. Dearness as a pioneer of mycology and phytopathology in Canada. In his reply, Dr. Dearness spoke about the early days in mycology. "When I started teaching, in the pre-Pasteurian days," he said, "bacteriology was taught in one or two lessons. The amazing development which the science of microbes underwent in the last fifty years, another science, *virusology*, will witness in the years to come." Dr. Emile Jacques is the phytopathologist in charge of the new laboratory, for which Mr. Hagelstein is preparing a study collection of myxomycetes.

Fordham Centenary. Board and staff members of the New York Botanical Garden who were appointed as representatives to the Centenary Celebration of Fordham University Sept. 15-17 included Mr. J. R. Swan, President, and Dr. William J. Robbins, Director, who attended on behalf of the Garden; Dr. B. O. Dodge representing the Torrey Botanical Club; Mr. Robert Hagelstein, the Microscopical Society of New York; and Dr. F. J. Seaver, Morningside College. Delegates were guests of the President of Fordham, the Rev. Robert I. Gannon, S.J., at a banquet at the Waldorf-Astoria the evening of Sept. 17.

Ragweed. Early last month, Borough President James J. Lyons urged introduction of a bill in the City Council to compel property owners in the Bronx to eliminate ragweed from their grounds before August 10 each year, for the relief of hay-fever sufferers at that season. Behind this bill is a campaign which was waged this past summer by the Riverdale-on-Hudson Garden Club, of which Mrs. Clarke G. Dailey is president. The club is one of the Affiliates of the New York Botanical Garden. Throughout the campaign, Mrs. Dailey reported, the utmost co-operation was received from the Park and Health Departments of the borough. These offices, in turn, reported greatly increased interest on the part of property owners and intensified activity which resulted during the past summer in the removal of vast quantities of ragweed from the Bronx.

Colchicums. Two hundred flowering bulbs of the autumn "crocus," *Colchicum autumnale,* were displayed in late August in the Museum Building. They were a gift from Mr. Howard Eric of Stamford, Conn., and were shown as examples of plants that will bloom without soil or water.

Field Trips. Dr. H. N. Moldenke led a field trip for the Torrey Botanical Club to Seeley's Notch in the Watchung Mountains Sept. 7 and on Sept. 8 to Wetumpka Notch and Washington Valley.

Affiliate. The Riverdale-on-Hudson Garden Club met at the Garden Sept. 27, making a tour of the Museum Building and seeing the Garden's motion picture in the Members' Room with G. L. Wittrock as speaker.

Men's Club. Outdoor plantings were visited Sept. 11 by 25 members of the Men's Garden Club of New York City under the guidance of P. J. McKenna.

Fire. The roof of the manure shed at the New York Botanical Garden burned the evening of Sept. 1, resulting in a loss of approximately $1,500. The cause of the fire was not determined.

Editor. Robert S. Lemmon, a member of the Garden, and a speaker on several of the Garden's programs, has joined the staff of the *American Home* magazine, which plans to give more attention to horticultural material. Mr. Lemmon's own magazine, *Real Gardening,* was incorporated in July with the *Gardeners' Chronicle of America.*

Visitors. Among the Garden's visitors during September were Dr. William C. Steere and Dr. Robert J. Lowry, both from the University of Michigan, who spent a week working on mosses; David Sturrock of the Atkins Institution in Cuba, reading on the mango; Dr. S. P. Doolittle of the U.S.D.A. in Washington; Señorita Zoraida Luces of the Servicio Botanico in Caracas, Venezuela, who has been spending a year working on grasses with Mrs. Agnes Chase in Washington; Alain White of Litchfield, Conn., authority on the Stapeliae, who showed colored slides of succulent plants of the southwestern deserts at a gathering of staff members; Father Philip H. O'Neill, graduate student at Fordham, who is preparing himself for a teaching post in biology in the Philippines; Paul J. Allen of the University of Pittsburgh; Alton H. Gustafson, Williamstown, Mass., David R. Sumstine of the Carnegie Museum, Pittsburgh; W. Faitoute Munn, West Orange, N. J., and E. B. Cummins, M. C. Miller, and G. C. Ridland, diatomists from the Johns-Mansville Co.

National Academy. Dr. William J. Robbins and Dr. B. O. Dodge were scheduled to speak at the meeting of the National Academy of Sciences in Madison, Wisc., Oct. 13, Dr. Dodge on "Heterocaryotic Vigor and 'Dominance' in *Neurospora*" and Dr. Robbins on "Vitamin Deficiencies of *Ceratostomella.*"

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Preserving Nature's Balance

WILDLIFE CONSERVATION. Ira N. Gabrielson. 250 pages, illustrated and indexed. Macmillan Publishing Co., New York. 1941. $3 50

Here is a book that makes one wish that it were possible to place it in the hands of every adult American, for it is a word-picture of conservation admirably presented.

In very clear and concise language the author explains the close relationship that exists between forest, water, soil, grasslands and the wildlife that lives only where the environment and conditions necessary for their existence are kept in natural balance. This makes very understandable the chapters on the plans for the restoration of wildlife and the great need for our peoples to understand the vital importance to themselves of not only the restoration but the proper use of America's "renewable natural resources."

MRS. CHARLES DOSCHER.

Bacteriology—Two New Editions

FUNDAMENTALS OF BACTERIOLOGY. Martin Frobisher, Jr. 653 pages. 326 illustrations, index. W. B. Saunders Co., Philadelphia. Second edition. 1940. $4.

A relatively up-to-date and exceptionally interesting text with a medical slant. It includes several good sections on technique.

ELEMENTARY BACTERIOLOGY. Joseph E Greaves. 587 pages, 164 illustrations, index. W. B. Saunders Co., Philadelphia. Fourth edition. 1940. $3.50.

A text emphasizing the applications of bacteriology to everyday life, especially in the fields of personal and public health.

VIRGENE KAVANAGH.

Birds And Butterflies

THE AUDUBON GUIDE TO ATTRACTING BIRDS. Edited by John H. Baker. 267 pages, illustrated with photographs, indexed. Doubleday, Doran, New York, 1941. $2 50.

The National Audubon Society presents a book which is designed, by means of good reading, to encourage people to bring more birds into their trees and shrubbery and to give them a more intelligent interest in protecting and aiding birds.

BUTTERFLIES. Ralph W Macy and Harold H. Shepard. 247 pages, illustrated in color, indexed. University of Minnesota Press, Minneapolis. 1941 $3.50.

Keys and descriptions with several colored plates of butterflies, preceded by a long explanatory chapter merely entitled "About Butterflies."

Scale Insects

ATLAS OF THE SCALE INSECTS. Gordon Floyd Ferris. Serial Nos. 269-384. Stanford University Press, California. 1941. $7.75.

The third series of Dr. Ferris's highly specialized treatment of scale insects with magnified drawings of each species.

Nitrogen-Fixing Bacteria

THE BIOCHEMISTRY OF SYMBIOTIC NITROGEN FIXATION. Perry W. Wilson. 302 pages, illustrated with photographs and diagrams, indexed. University of Wisconsin Press, Madison. 1940. $3.50.

Chemistry and biology combined in an explanation of the action of the bacteria which capture nitrogen and make it available to plants in the soil.

Two Pamphlets For Horticulturists

THE PLANTING, FERTILIZATION AND CARE OF NUT TREES. Russel J. Smith. 14 pages. Sunny Ridge Nursery, Swarthmore, Pa. 1940 25c.

A small practical booklet for the grower of nut-bearing trees.

HYDROPONICS—FOOD WITHOUT SOIL. Isabel C. Hilyer. 116 pages, illustrated. Penguin Books, Harmondsworth, England. 1940. Distributed in New York. 25c.

A paper-covered booklet printed on newspaper stock, a diary description of how growing plants without soil can be made easy for the amateur.

Wonders And Mysteries

MAGIC IN A BOTTLE. Milton Silverman. 332 pages, indexed. Macmillan, New York, 1941. $2.50.

Conversation put into the mouths of scientists and their co-workers to lend drama to the stories of their discoveries of important and powerful drugs.

THE MARVELS AND MYSTERIES OF SCIENCE. Edited by a group of scientists 818 pages, illustrated with photographs and indexed. Wm. H. Wise & Co., New York, 1941. $2.95.

"Everything you could possibly want to know in five great fields of science" is the publisher's announcement for this book. The heavens, the earth, matter and energy, living things, and man are the five great fields. Out of 818 pages, plant life, without which human life could not exist on this earth, occupies 36 pages, or 4.4 per cent. Some few curious minds might like to know a little more about the living things that help to keep much of the rest of the world alive.

Community Landscaping

LANDSCAPE ARCHITECTURE IN THE MODERN WORLD. Karl B. Lohmann. 163 pages, illustrated, indexed. The Garrard Press, Champaign, Ill., 1941. $2.50.

Brief chapters chiefly on the type of landscaping which affects the community, such as outdoor theaters, parkways, airports, cemeteries, golf courses, and schools.

Pictures Plus

FLOWERS: THEIR ARRANGEMENT. Gregory J. Conway. 139 pages, more than 50 full-page illustrations, 130 smaller ones; 25 pages of text. Alfred Knopf, New York, 1940. $2.50.

The author of Flowers: East-West has prepared a handbook much of which shows through photographs the process of building up a flower arrangement in the Japanese style.

WHO'S ZOO IN THE GARDEN. Jean-Marie Putman and Charles Palmer. 126 pages, illustrated and indexed. The Greystone Press, New York, 1941. $1.50

Mostly silly verses and sketches with comments on some common plants.

122 *Years of Farm Journalism*

THE AMERICAN AGRICULTURAL PRESS. 1819-1860. Albert Lowther Demaree. 430 pages, photographs, index, bibliography. Columbia University Press, New York, 1941. $4.

The bibliography of this book of 389 pages runs to 15 pages. That fact alone is testimony to the vast amount of labor and research that have contributed to its making.

Beginning with "the pioneer and father of American farm journalism . *The American Farmer* . . . 1819 in the city of Baltimore," it relates the trials and tribulations and also the triumphs of the American agricultural press to this day. While farm crops come in for their share of consideration, the most amusing chapters are those dealing with the subjects of advertising, rural poetry (some gems in this!) and the rise and fall of the agricultural fair (it seems unbelievable to us who have never seen a side-saddle that on these occasions great polemic battles took place on the propriety of women riding astride). The adoption of steam power to agricultural machinery and the opposition it created are well treated. A valuable source book.

ADRIAN VAN MUFFLING.

Systematics for the Young

AN INTRODUCTION TO BIOLOGY. J. C. Cross. 507 pages, 331 illustrations, glossary and index. C. V. Mosby Company, St. Louis, 1941. $1.90.

When introducing biology to a child, it is reasonable to insist upon one rule, and that is that the introduction must captivate the interest and attention. From years of experience with a variety of syllabi, biology teachers find that the most interesting approach to their subject is a functional one and the least interesting is the systematic approach which attempts to classify all the living things in the child's environment.

This book devotes about 350 of its 500 pages to systematics, presenting not only the various phyla of animals and plants but in most instances the orders and families as well. The remaining pages which one would expect to be devoted to life functions treat the functions as merely subsidiary to the anatomy of the various systems of the body.

Dealing largely with the flora and fauna of the South, the volume has been written for students in the southern states.

If, as the author states, "the primary purpose of this book is to generalize," one would be forced to admit that this book fails completely in doing this but rather consists of a mass of specialized data which would frighten away any first-year student.

No effort seems to have been made to set the thought processes of the child to work. Such topics as "evolution" are completely omitted from the text.

SOLOMON FRIEDLAND,
Andrew Jackson High School.

Current Literature At a Glance*

Cornell. A beautifully illustrated booklet of 16 large pages describes the new Cornell Arboretum at Ithaca, N. Y. History, objectives, accomplishments, and needs for the future are outlined. The photographs show natural scenery and ornamental plantings of the area. Mr. Nelson M. Wells, a member of the Corporation of the New York Botanical Garden, was Landscape Consultant in charge of the arboretum's plans. Copies of the booklet are obtainable without charge from the Provost of Cornell University.

Cycad. *Garden Life,* which is published by the St. Louis Horticultural Society, contains in the September number a note regarding the New York Botanical Garden's specimen of *Stangeria paradoxa,* which was artificially pollinated last winter. The article calls attention to the fact that the Missouri Botanical Garden has two specimens of this rare cycad—the second one having been derived from division of the first, which was acquired 28 years ago—and that there are several small plants in the collection of Dr. David Fairchild at Coconut Grove, Fla.

Photography. Some helpful hints for plant photography, especially close-up

* All publications mentioned here—and many others may be found in the Library of the Botanical Garden, in the Museum Building.

work and magnification, are given by E. B. Mains of the University of Michigan in the September number of the Journal of the Biological Photographic Association.

Shade Trees. The Proceedings of the Sixteenth National Shade Tree Conference, which took place in Detroit last spring, contains a complete account of the conference, with papers on the care of shade trees and the cost of keeping them healthy, tree diseases and how to control them, technique of tree-repair work, and the question of standards for tree experts.

Paraguay. Cotton is raised in Paraguay for its fiber, for its oil from the seeds, and for the cakes which are made from the seeds and used as feed for horses. In a bulletin received from the Ministry of Agriculture, Commerce, and Industries, a surplus was reported, but the cotton situation, it was said, was not so bad as in Brazil and Argentina. Nearly 18,500,000 kilograms of cotton had been sold during the year. Of cakes 10,500,000 kilograms had been produced, and of cotton-seed oil 1,150,000 tons.

House Plants. Warning as well as encouragement on the culture of plants in the living-room is given by J. B. Wingert in Bulletin P14 (new series) of the Agricultural Experiment Station of Iowa at Ames. Ten pages of general culture and care are given, followed by a discussion of 20 important house plants and a tabulated list of nearly 50 more. The bulletin is well illustrated with photographs.

Profit from Trees. How privately owned commercial timberlands may be made to pay their owners is told in booklet of illustrations (Miscellaneous Publication No. 381) issued last fall by the U. S. Department of Agriculture. The good results of selective cutting and fire prevention are graphically shown.

India. Plants which are cultivated in the Lloyd Botanical Garden at Darjeeling, India, are listed alphabetically, with family designations, in No. 5, Vol. 5, of the Records of the Botanical Survey of India, published in Calcutta. More than 1,500 plants, half of them indigenous to the Himalayas, are grown in this 40-acre garden.

Geranium Troubles. An exhaustive treatment of leaf-curl and mosaic of geraniums is given by Leon K. Jones in Bulletin 390 of the Agricultural Experiment Station of Washington. Methods of control for these two virus diseases are given.

Chrysanthemums. In the Bulletin of the Chrysanthemum Society of America for the third quarter Alex Laurie and Arnold Wagner discuss "Deficiency Symptoms of Chrysanthemums." A more complete report of their work appears as Ohio Agr. Exp. Sta. Bul. 611, 1940.

For Soils. Treatment for the prevention of diseases in greenhouse and seedbed soils is described in Bulletin 217 from Cornell University. In Bulletin 455, approved fertilizers for New York crops are tabulated.

Ducks and Swans. Conservation-minded persons may obtain recent leaflets on the trumpeter swan and the present situation with wild ducks from the Emergency Conservation Committee, 734 Lexington Ave., New York City. This committee is doing extensive work toward the preservation of native plant as well as animal life.

Nutrition. The effect of deficiencies in the chemicals taken in by plants is shown in color in an illustrated booklet, "If They Could Speak," published by the Chilean Nitrate Association.

Sphagnum. Often maligned and frequently praised, sphagnum is worth a good argument any day among gardeners. Vernon Stoutemeyer, Claude Hope, and Albert Close give a preliminary report with charts and illustrations showing how sphagnum used in seed germination inhibits damping-off losses on unsterilized soil. Their article appears in the April *National Horticultural Magazine.*

Heated Soil. Reaction of newly transplanted oak trees to soil that has been electrically heated over winter is described in *The Arboriculturist,* published by the Davey Tree Expert Co., Jan. 1941. Nine specimens of similar size were selected for the experiment, and records of the behavior of the trees, including the three that were used as checks, are given over a period of several years.

THE NEW YORK BOTANICAL GARDEN

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A. C. PFANDER ..... *Assistant Superintendent*

To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia once a year, each number illustrated with eight colored plates of unusual plants, accompanied by descriptions.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays, programs, lectures, and other events at the Garden.

(5) Credit to the amount of the membership fee paid, toward courses of study offered by the Garden.

(6) The privilege of borrowing lantern slides from the Garden's collection.

(7) Use of the Members' Room in the Museum Building.

A limited number of garden clubs are accepted as Affiliates. The privileges of affiliation are one lecture a year by a member of the staff, a share in the distribution of plants when they are available, a subscription to the Journal and to Addisonia, and announcements of special activities at the Botanical Garden. In addition, any member of an affiliated club may enroll for one subject each year in a study course for one-half the regular fee. Beginning January 1, 1942, this regulation will read: "Any member of an affiliated club may receive for the current year of membership a reduction of $5 in the fees paid for instruction. This does not apply to the course for professional gardeners." An Affiliate Garden Club may borrow lantern slides from the Garden's extensive collection, such loan being subject to the regulations for the use of lantern slides by individual members. Likewise, an affiliate club may engage without fee the Members' Room at the Garden for its meetings.

The classes of membership are as follows:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Affiliation	annual fee for club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
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Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

Contributions to the Garden may be deducted from taxable incomes. The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————————.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

THE NEW YORK BOTANICAL GARDEN

ANNOUNCES

the publication, about December 1, of

BANCKES' HERBAL (1525)

IN MODERN ENGLISH, WITH A FACSIMILE OF THE ORIGINAL

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A description of this rare volume in its modern dress will appear in the next number of the Journal.

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*Plants Need Vitamins Too**

By William J. Robbins

FOR many years, it was believed, vitamins were essential only to animals; but research in the past few years has shown that they are equally needed by plants. In fact, it appears that these substances in infinitesimal amounts perform the same vital role in the normal growth and development of plants as they do in animals.

To make this clearer let us go back to 1911 when the name "vitamin(e)" was first applied by Casimir Funk to a specific organic substance assumed to be present in food and essential in minute amounts for the continued existence and well-being of animals, human beings included. It was soon found that there were many different vitamins—in fact, the list is still expanding as new discoveries are made—and that an insufficiency of them had detrimental results. In their absence from the nourishment of man such diseases as beri beri, scurvy, rickets, dermatitis, and pellagra occurred, growth and reproduction met with interference, and certain nervous disorders appeared. Then those ubiquitous inquirers into the mysteries of nature—the chemists—succeeded in isolating some of the vitamins in pure chemical form, and in some instances even in making vitamins in their laboratories.

As investigations proceeded on the number and kinds of vitamins, on their chemistry, and on their effect upon animals, it gradually came to be recognized that most plants make their own vitamins—or, as the scientist says, they synthesized them from simple materials. Animals could not do this, but had to secure them either directly or indirectly from plants. There was at first little convincing evidence that vitamins played any significant role in the physiology of the plant. They were made by plants and used by animals, a fortunate circumstance for the animals and a sort of philanthropic activity on the part of the plants.

* Adapted from a radio interview given from Schenectady, N. Y., Nov. 5, 1940, over WGY and other stations for the General Electric Science Forum.

However, as the result of discoveries made within the last five years, we now know that plants are not so much the philanthropists we thought. They too need vitamins, but, as though possessed of more foresight, or at least more self-sufficiency than the animals, most plants make their own vitamins. Only a few of them, and these chiefly the lower plants, suffer from vitamin deficiencies; that is, they cannot develop unless the material upon which they grow contains some of the missing vitamins—which, of course, must come from some other kind of plant or from an animal that has obtained them from a plant. Certain bacteria and molds, also some strains of yeast, need to be supplied with vitamins. Very few, if any, of the vegetables and flowers and other green plants, however, need to have vitamins supplied to them. To the best of our knowledge they make all they need for themselves.

Does this mean, it might be asked, that despite the great deal of publicity on this subject, supplying green plants with vitamin B_1 is not beneficial? This is difficult to answer categorically because the effects of the application of vitamin B_1 to green plants is still in an experimental stage. Some investigators have reported good results on some kinds of plants and not on others. Many have obtained negative results, and a few have found the application of vitamin B_1 to be detrimental. Either the conditions under which vitamin B_1 is beneficial to green plants are poorly known, or its application does not bring favorable results. Certainly, the use of vitamin B_1 in horticultural practice does not accomplish the miracles some would have us believe, and no reputable horticulturist would recommend its use under normal garden and greenhouse practice. Apparently green plants themselves make all the vitamin B_1 they need and even a little more, a fortunate situation from which we profit because the extra B_1 that the plant makes is the normal source of our supply.

You may be interested to know that, as seen through the microscope, vitamin B_1 is a white crystalline organic compound which contains carbon, hydrogen, oxygen, sulphur, and nitrogen. It is now synthesized by the chemist and can be purchased by the gram or pound from any recognized chemical company. It is an expensive substance, one pound costing something in the neighborhood of $800. However, for plants that need this vitamin the amount required is extremely small. A measurable effect on the growth of the breadmold, for example, can be obtained with 0.003 gamma of vitamin B_1, which is approximately one trillionth of a pound, which is about one millionth of a cent's worth. It is thereby seen that vitamins are effective on plants—and on animals too—in extremely small amounts. Biotin, which is also called vitamin H, produces a measurable effect on a certain mold in amounts as small as *one trillionth of a gram,* and it takes 480 grams to make a pound.*

* Seventy-five gamma of Vitamin H can be purchased for $10, which is at the rate of $62,400,000 per pound.

Photograph by Fleda Griffith

A MOLD (*Ceratostomella ips*) WHICH MUST BE SUPPLIED WITH THREE VITAMINS BEFORE IT WILL GROW.

These tubes all contain a jelly-like material (agar) with minerals, sugar and a source of nitrogen, and all have had a small bit of the mold placed on the jelly. The first tube contains no vitamins; to the second vitamin H was added; to the third, vitamin B_6; to 4, vitamin B_1; to 5, vitamin H and B_6, to 6, vitamin B_6 and B_1; to 7, vitamin H and B_1; and to 8, all three vitamins—B_1, B_6 and H. Note that the fungus grew only when all three vitamins were added to the jelly medium.

While we have mentioned here only vitamin B_1 and one or two others, no one can say how many may be concerned in the metabolism of a plant. There are perhaps a dozen vitamins or vitamin-like substances which are now known to play a role in the lives of plants, and there are probably many more which remain to be discovered. It has been found in the laboratories of the New York Botanical Garden that vitamin B_6 is necessary for plants, and scientists there are now working on an unknown factor, called for convenience "Factor Z," which is probably a new vitamin.

In performing the same function in plants as they do in animals, vitamins act as coenzymes. That is, they are essential parts of enzyme systems. Without vitamins, an enzyme system cannot function. Without enzymes, the chemical changes that occur in living bodies cannot take place. For example, sugar undergoes a series of chemical changes in the body. Several enzymes make these changes possible, and one of them is called carboxylase. Vitamin B_1 is necessary for the activity of carboxylase and when this vitamin is lacking, the use of sugar by the body meets with interference. The food a man eats—that is, fat, sugar and proteins—can do him no good unless vitamins are present to enable him to use it. The same situation exists in plants. Their food also is used through the agency of vitamins.

The question may be asked that if the use of vitamin B_1 in horticulture is still experimental, and if most plants make all the vitamins they need, why is the study of the relation of vitamins to plant growth of any importance?

There are many reasons. Even though vitamin B_1 seems to be present in sufficient amounts in green plants to permit these to develop satisfactorily without feeding them more of it, there are many other vitamins, some as yet unidentified, and we know relatively little of their relations to the growth of green plants. If we search further we *may perhaps* find a vitamin not made by green plants in large enough quantity for their maximum development—one which when fed to the plant will actually perform part of the miracles our commercially minded friends have told us could be accomplished with vitamin B_1.

Furthermore, it is quite necessary for us to understand the nutrition of bacteria, yeasts, and molds, especially those which suffer from vitamin deficiencies, because these lower plants are most important to us in causing disease and decay as well as bringing benefit through their relation to fermentation, cheese-making, and many other similar processes.

If we want to control these lower plants—limit their detrimental activities and encourage their beneficial properties—we must understand how they live. As only one example, the edible morel is one of the most delicious of fungi, far superior to the mushroom we buy in the markets. Yet no one has succeeded in cultivating it. Why? Perhaps it suffers from vitamin deficiencies which have never been properly satisfied by the materials upon which it has been cultivated.

But even if further research should show that the use of vitamins in practical horticulture is of no significance, the study of the relation of these substances to plants is of importance because of the light it may throw on their use for animals. Plants have been found to be useful tools in determining the presence and in estimating the quantity of various vitamins, in indicating how vitamins work in the animal, and in leading investigators to the discovery of new vitamins. Pantothenic acid, first discovered in studies with yeast, has been found to cure a disease of chickens and one of human beings. Biotin, or vitamin H, likewise first discovered in yeast research, has also been found to be important for man.

Entirely aside from the practical importance of using plants to increase our knowledge of a class of substances so important for animals, it should be a salutary corrective of undue pride on the part of the human race to learn that the same vitamins are concerned in the development of the humble yeast plant as in the growth of man, and that they probably perform the same functions in both organisms.

Stone-Mimicry And Windowed Plants

By E. J. Alexander

A miniature desert scene for miniature plants that carpet the gravelly earth of arid lands in South Africa is laid out in House 6 in the Main Conservatories at the New York Botanical Garden. Here may be seen a hundred or more species of plants that are native to these regions -many of them plants which so closely imitate the stones around them that they are seldom noticed except when they bloom. Among them are members of the group known as windowed plants, which also are hidden amid their surroundings until they flower. The Garden is believed to have the largest collection of these plants in the country. In the third of a series of articles on succulent plants, based on those in cultivation at the Garden, Mr. Alexander here describes the curious stone-mimicry and windowed plants of the South African deserts. The photographs are by the author and by Fleda Griffith, the Garden's staff photographer.

WE are all familiar with protective mimicry in the animal and insect worlds. We have read and seen how certain living creatures have such coloring, markings or form that, when not in motion, they are indistinguishable from their surroundings and are thus safeguarded from their enemies. This same sort of protective coloration and form exists also in the vegetable world, especially among the fleshy plants that are natives of arid regions, where their very succulence, by means of which they survive on slight rainfall, would render them juicy morsels to the animals that would find them, were they prominently green. What appears to be an environmental response in these plants makes them simulate the rocks among which they grow, so that only when in flower are they visible to the casual observer.

The most perfect and most numerous mimickers are inhabitants of the arid and semi-arid regions of South Africa, especially the desert-like southern and western coastal areas and the even dryer regions of the interior, where the earth must often go without a drop of rain for eight to ten months and a dry period of twenty months has been known to occur.

Now plants that are to survive under such conditions must become adapted to storage of water and protection against excessive loss of moisture by evaporation.

The problem of water storage is met by development of special tissues which result in fleshy stems or leaves or large tubers being formed. Protection against loss of moisture is met in several ways. The leaves (when they are present) and also the stem usually have a covering of hair, wax or resin which has an insulating effect against dry air and extreme heat. But often the leaves are reduced either to a minimum in number or size, or are dispensed with completely. When this occurs the stem often becomes green and succulent and then takes over the functions of the leaves.

The umbrella-like flowers of Conophytum Vanzijlii are pink; the roughened, rounded plant-bod are scarcely distinguishable from the surrounding stones.

The particular plants with which we are here concerned are a group that have carried such specialization and also mimicry to the highest state of perfection known in the plant world. They have reduced themselves to one or two pairs of leaves which are so thick and fleshy as to be perfect water reservoirs. In form many of them are nearly round, thus they contain the greatest possible volume and present the least possible surface to the evaporating effects of air and sunlight. Their protective imitation is so remarkably developed that those which grow among the loose stones of the rocky desert lands exhibit a coloration similar to that of the stones over the entire plant-body; others, which have a translucent membrane, grow with only the flat tops of the leaves at the ground surface, and these membranes often have colors and markings which make them resemble either the stones around them or the color of the soil. The first are called STONE-MIMICRY PLANTS, the second, WINDOWED (not window) PLANTS.

By far the greatest majority of these plants are in the group horticulturally called Mesembryanthema, for they were once included in the genus *Mesembryanthemum*. Within the last twenty years, much research has been done in this group, resulting in the breaking up of the old genus into about 150 different genera, about a score of which are either "stone" or

windowed plants. The distinctions between these many genera are based primarily on their fruits, but they are nearly always supported by differences in flower structure and plant form. The fruits are capsules which are exceedingly intricate in their construction, and they are also hygroscopic—that is, the valves open only when the fruit is wet, so that the seeds may be liberated when conditions are most favorable for germination, as in periods of rain or heavy dew.

The stone-mimicry plants belong to the genera *Lithops, Conophytum, Pleiospilos, Gibbaeum, Rimaria, Oöphytum, Didymaotus, Dactylopsis, Monilaria, Lapidaria, Dinteranthus, Muiria, Argeta, Argyroderma, Aloinopsis, Nananthus, Aistocaulon, Titanopsis*, and some others that have not come into cultivation.

The invisibility of such plants as *Lithops* in their desert home is best illustrated by the story of a visitor to the Karroo who frequently used a path which at one place crossed a bare, gravel-strewn area.[1] One day he noticed that some of these supposed stones had borne yellow flowers, and the number of flowering stones increased daily until there were hundreds in bloom on this barren area. The plant concerned was *Lithops Leslici*.

[1] For this story and other details see "Mesembryanthema" by Brown, Tischer, Karsten and Labarre.

Two fruits, from one of which the seeds have been dispersed, are shown on this plant of Pleiospilos Bolusii. The valves, which are seen in the mature capsule at the right, open only when there is moisture enough in the air to enable the seeds to germinate.

one of many similar mimickers. It is rather striking that the flattened tops of the rounded leaves in species of this genus always match more or less the color of the soil or surrounding stones. Those with gray or brownish gray tops occur among quartz, granite, limestone or yellowish sand and hence are usually not noticeable when out of flower. Those with brown or reddish-brown tops grow in gravel of these colors.

The pair of flat-topped leaves, separated by a cleft, comprises the entire plant-body in the genus *Lithops*. When growing under natural conditions only this top is exposed, the sides being buried in the soil or gravel. In their yellow or white flowers, which are as large as the top of the plant, the numerous strap-shaped petals are separated from each other nearly to the base.

In the species of *Conophytum*, the plant-body is also formed of two fleshy leaves, but these are completely united with only a short slit in the upper surface, and they are not buried, but owe their "invisibility" to their resemblance to plain grayish, veined, or marbled pebbles. Their flowers run a greater scale of color—white, cream, yellow, orange, red, pink, and purple—and the petals are united into a slender tube so that each flower stands up like a little umbrella. The plant-bodies are of three different forms—rounded, top-shaped with a flat upper surface, or flat-sided with a bilobed top. The pebble-like appearance is gained by a pattern formed of dark lines made by the confluence of many small dots.

In *Pleiospilos* we have a slightly different form of mimicry. The plants ordinarily have one pair of distinctly separate leaves (two pairs are usual in cultivation), about the size of a duck egg, brownish gray with a touch of green, and covered with raised dots of a darker hue, giving a roughened surface like the weathered stones among which they grow, half-buried. It therefore requires a keen eye to detect them ordinarily, but the large yellow flowers which turn orange as they age make the plants quite showy in blooming season.

Probably the most unusual case of mimicry in the group is that of the single species of *Didymaotus*. It is found only on a restricted area of the Karroo where the plains are quite bare except for a covering of two kinds of stones, rust-colored and slate-colored shales more or less angular in form. On certain sections these fragments form a surface as level as though they had been passed over by a steam-roller. On these precise sections and only on them is this rare plant found. It usually has two pairs of leaves, the old pair of the previous year larger and more angular and rusty brown in color, the young pair smaller and more rounded and slate-colored. Thus on one plant the leaves mimic both kinds of the stones around it. The white flowers are produced, not from between the leaves as are others of this group, but from the outer sides of the plant-body.

Several genera have members that grow in white quartz soil, where their white, grayish or bluish coloring renders them well-nigh invisible. The

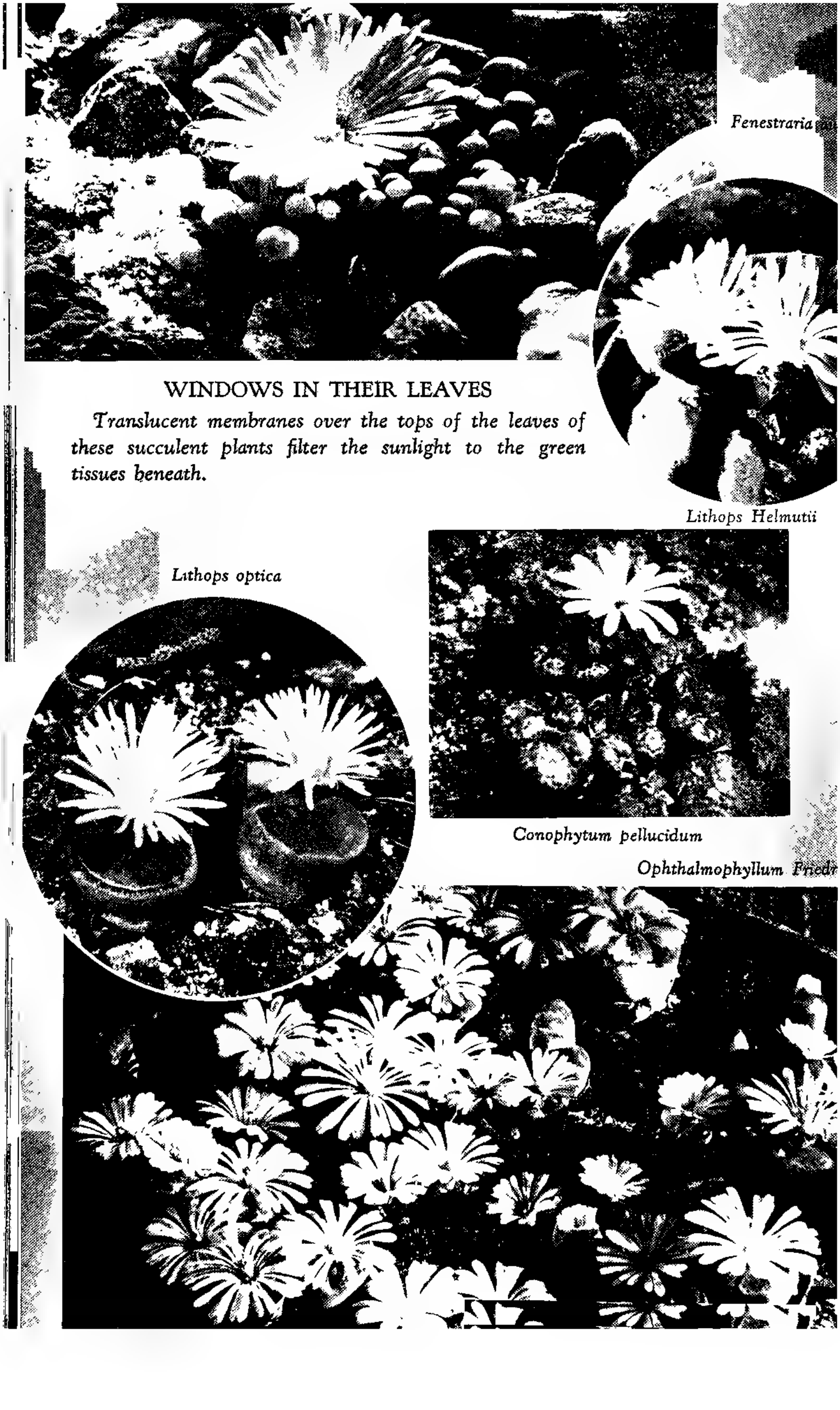
species of *Gibbaeum* owe their whiteness to a close covering of microscopic hairs. They usually grow in large cushions which look like a pile of white quartz slivers that become conspicuous when bright pink or reddish flowers are present. One kind is white flowered. They are easily distinguished from the other "stone" plants by their two close-pressed unequal leaves which make a finger-like plant-body.

The shriveling of the old leaves as the new growth appears is shown in these three plants of Argyroderma.

The species of *Argyroderma* are marked by an exceptionally firm, smooth skin of a white or bluish color. Since they consist of but two rounded leaves with a deep cleft between, they closely resemble the broken pieces of white quartz among which they grow.

Another outstanding rarity is the one species of *Muiria*. Here the plant-body is perfectly round, the two leaves having completely united, so that when the flower appears, it bursts out of one side of the plant-body. This plant, of course, is another of the pebble mimickers, appearing, with its covering of fine gray hairs, merely as if it were another one of the small stones around it.

A peculiarity known only from its occurrence in these plants is the manner in which the new leaves, which comprise the plant-body, develop inside of the old. What happens is that while the new growth is developing, it drains the nourishment out of the old growth, so that this takes on a shriveled, parchment-like appearance. As the fleshy new leaves increase



Fenestraria

WINDOWS IN THEIR LEAVES

Translucent membranes over the tops of the leaves of these succulent plants filter the sunlight to the green tissues beneath.

Lithops Helmutii

Lithops optica

Conophytum pellucidum

Ophthalmophyllum Friedr

in size, they eventually break through the dried skin of the old growth, and this skin is then shed like a discarded coat. Since the fruits are formed within the plant-body, it is only when this old skin is cast off that the seed-pods become visible.

There remains but one other different type of mimicry in this group. The species of *Titanopsis* grow with numerous leaves in a dense rosette. The exposed surfaces are covered with irregular whitish excrescences that match exactly the weathered incrustations on the fragments of lime tufa between which they grow.

In an entirely different family, the Crassulaceae, are a few similar cases of mimicry. Several small species of *Crassula,* especially *C. deltoidea, C. columnaris,* and *C. corallina,* are in this category.

C. columnaris in its rest period, at which time it is in a semi-dried condition, is yellowish brown in color in imitation of the rusty gravel where it is found, not only in shape and color, but even in the rough surface-texture. The other species, however, are mimickers of the granite pebbles and fragments which mark their natural haunts.

But now we must look at an entirely different type of protection, that of the removal of the breathing pores and chlorophyll cells to portions of the plant not directly reached by the sun's rays. This occurs in the windowed plants, much less in number than the mimics, but even more unusual in character. Buried in sand or gravel with only the upper surface exposed, these plants manage transpiration through their sides and receive the sun's rays through windows at the surface which filter the sunlight to the green tissues lying below. These windows consist of a thick epidermal tissue which is translucent or even transparent in some species. The cells of the windows contain a few scattered crystals of calcium oxalate in their outer walls, and in some species rust-colored pigment grains which also help to reduce the intensity of the sun.

Outstanding among these plants are the two species of *Fenestraria,* which have large and showy flowers of pale apricot or white. Their club-shaped leaves, a dozen or more to the plant, have each a clearly defined, more or less triangular window like a small bladder at the tip. Closely similar is the structure of the one species of *Frithia,* the windows of which are wavy-edged, but while the panes of *Fenestraria* appear almost clear, those of *Frithia* look like frosted glass. The flowers of *Frithia* are rosy-purple.

The most clearly windowed of the genus *Conophytum* is *C. pellucidum,* wherein the windowed tops are divided by furrows into several irregular but lens-like bubbles. White flowers are freely borne on these tiny, inconspicuous, dull green and brown mottled plants.

In the genus *Ophthalmophyllum* we have a group of plants similar to the bilobed species of *Conophytum,* but with microscopically velvet pubescence and translucent bladdery-appearing tops. The white or pink flowers are

Pleiospilos nobilis

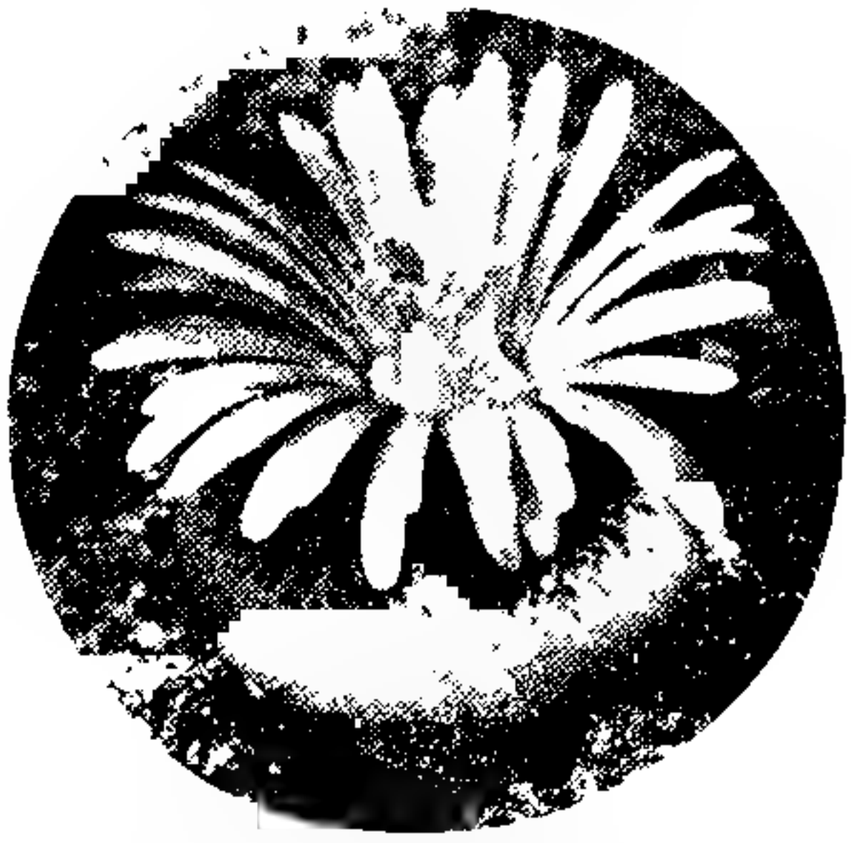
FLOWERING STON

FROM THE

DESERTS OF

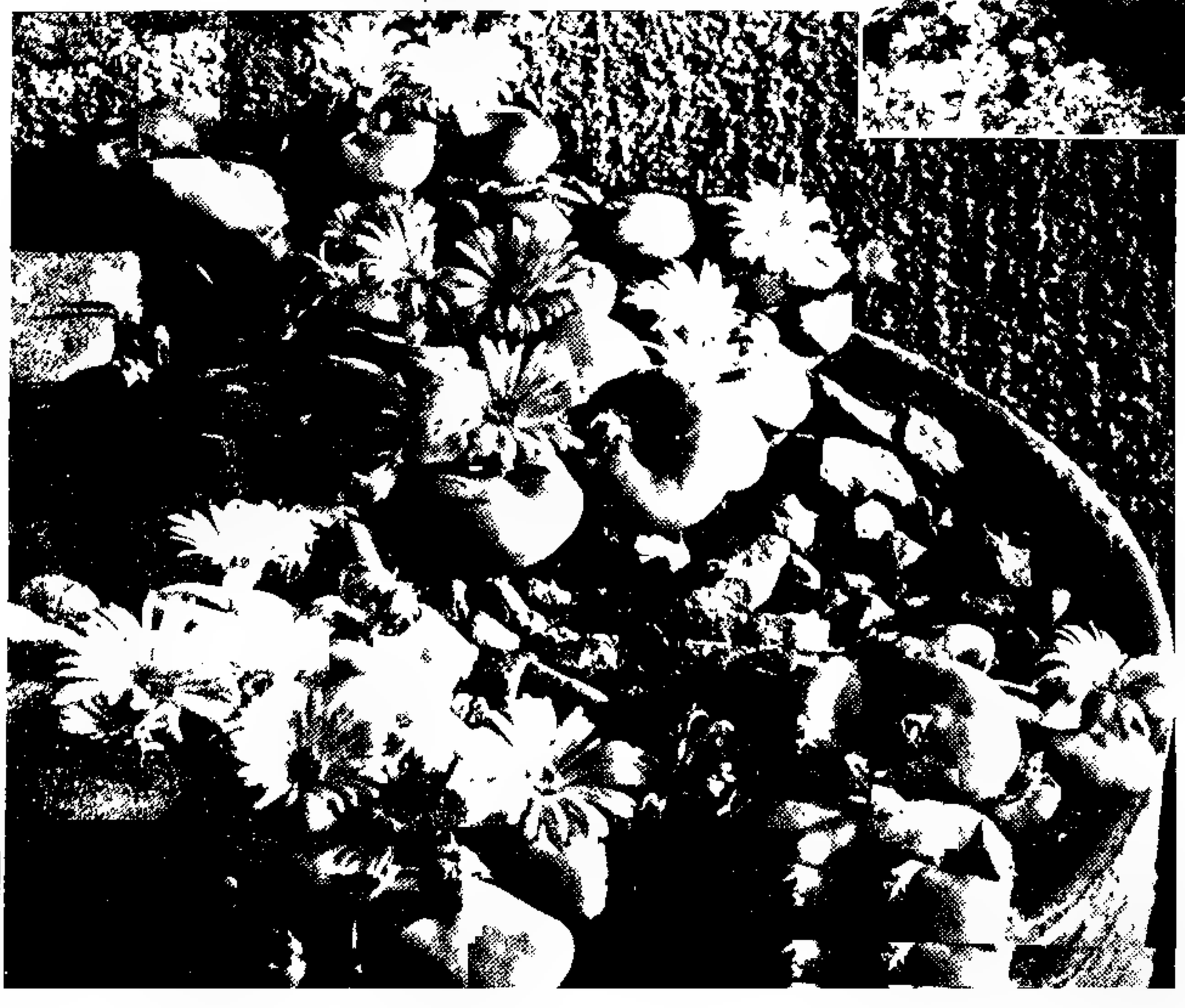
SOUTH AFRICA

These minute succulent
perfectly mimic the gravel
they grow that they are s
visible except when flowerin



Lithops turbiniformis

Lith ps Le lei



Conophytum W

Conophytum sororium

Lithops terricolor

Conophytum truncatellum

very similar to those of *Lithops.* The exceedingly rare monotypic genus *Imitaria* is similar in appearance, but different in floral structure.

While the *Lithops* species are mostly known as stone mimickers, all of those with marbled tops are also windowed plants; and certain others, such as *L. optica* and *L. Helmutii,* are splendid examples of this group, the windows being quite transparent and colorless.

In the Lily family we find two genera which have windowed structures on or toward the leaf tips. The genus *Haworthia* has some ten or more species in which there are windowed spots and streaks on the apical portion of the leaves. These spots are transparent because of the substitution of water-tissue for chlorophyll, but there are a few streaks of green coloring matter parallel with the veins. In the three species *H. Maughanii, H. truncata,* and *H. retusa,* however, the leaf-tips are abruptly truncated and have windowed tops. These plants grow in their natural habitats as do the members of *Fenestraria,* with the plant buried and only these transparent tips exposed. Very similar is one species of *Bulbine,* with egg-shaped leaves having flat, windowed tops.

One last type of these plants must be mentioned. In the Portulacaceae, the genus *Anacampseros* has some seven species which should be classed as having windows, though of a different sort. The numerous short stems,

It is only when Conophytum ornatum blooms that it becomes noticeable among the smooth stones of its native habitat. The flowers are yellow with dark red stigmas protruding from the center.

Anacampseros Alstonii, a member of the Portulaca family, has "window shades" for filtering the light. The papery bracts which closely cover the stems are shielding the plant's minute green leaves beneath them from the strong rays of the sun. The flowers are of a translucent white.

which comprise these plants, have a translucent, papery appearance. This is caused by the development of stipular scales to a size far surpassing and completely concealing the minute green leaves which they overlay like shingles. The sunlight reaching these tiny leaves must be filtered through these scales—which are more like window-shades than windows. Most of these plants have half-concealed pale yellowish flowers, but one species, *A. Alstonii,* has showy white blossoms an inch and a half across.

As to the why of these windowed plants we must assume that it is a matter of reducing moisture evaporation to a minimum which has caused their peculiar structure. The sun's rays in passing through the translucent water tissue are reduced in their intensity so that their effect is less drying. The lime crystals and reddish pigment grains act as a veil and also help in absorbing the blue, violet and ultra-violet portions of the sun's actinic rays.

The why of the stone mimicry plants, however, is not so clearly seen. Their stone-like coloring is thought by some to be the result of excessive insolation, by others protection from animals that would use them as food. It seems more likely that it may be a development of pigmentation adapted for filtering the actinic rays which green coloring matter cannot do. This question cannot, however, be finally answered until more physiological research has been done on the group.

Many of these plants are in danger of extermination in their native country by ostriches, baboons, monkeys, goats and other browsing animals who often find them in spite of their protective coloring. They are also

eaten by children, who call them "toontjes" (little toes), and by the Hottentots who seem to like their fresh acid, sometimes salty taste.

To us in the northern hemisphere, the main concern is that we have here one of the most remarkable groups of plants known to horticulture; many of them, it is true, difficult to grow, but most of them responding to controlled moisture and allowance for a normal resting period. Their attractive flowers and curious shapes will always make them of major interest in any display of succulents.

To Build A Boulder Garden

By A. C. Pfander

PERHAPS one of the most difficult types of rock garden to make (and therefore the most unsightly in most places) is the boulder garden. But many localities have no other rock to offer, and people desiring rock gardens are not always able to buy more suitable rocks and have them shipped, as the expense often runs into rather prohibitive figures. So where one must have boulders, the problem becomes one of arrangement.

Among the designs that gardeners have attempted to carry out, few have met with any degree of artistic success. Personally I can think of only one logical pattern—the moraine interpretation. By this I do not mean to say that a moraine pattern should be held to stone, gravel and sand only, but rather to a compromise between moraine and rock garden, keeping the character of the moraine in prominence. In a real moraine locality one will always find large and small boulders—and right here the first and most frequent mistake is made in the construction of the boulder rock garden.

Many people go to considerable pains to get boulders as nearly even in size and shape as possible and bury them at regular distances all the same depth in the soil, sometimes bordering walks or simply making an arrangement of more or less even rows with planting spaces between. In other gardens may be seen irregular heaps that at first impression look like discarded stones, the voids of which are filled with soil and planted.

Nature is not like that. Boulders are never found either in piles or in patterns spaced at equal distances. Stones are rolled into position by nature in a characteristic way. Some few will have found their path terminating abruptly together; others will have rolled further, forming smaller or larger groups of their own; but there is never a group where the sizes are alike.

In planning the boulder garden some few larger groups (or one large group, depending on the size of the garden) may make the background at

the top of a low slope, one large boulder (preferably with one flat side) may be implanted half way down the slope, where it holds a few smaller stones from rolling further, while the bottom of the slide should be a natural hollow where the slide terminates with an irregular arrangement of large and small boulders, some nearly buried, some half out, and others on top of the soil.

It is very important to place these boulders with extreme care, as any attempt at regularity would hopelessly spoil the natural character of the picture.

Then if one contrives to have a few tongues of sand and gravel with some larger rocks arranged to look like miniature slides on the slope with their broad bases extending into the hollow, the result will be something very artistic which needs no apologies in the best of gardens. A boulder garden like this can be built by anyone who is willing to study the natural appearance of a moraine and adapt the arrangement of it to his own garden. All plans should be made with an allowance for a 14- to 18-inch depth of soil for the plants.

The low bowl or hollow would lend itself well for the building of a section for subsoil irrigation to accommodate such plants as are known to resent our hot summers and demand a ready supply of cool moisture around the roots for successful growth. A shallow concrete tray, perfectly level and about 6 inches deep, with a trickle of water coming in on one side and overflowing on the other, with provision for draining during winter, makes an ideal arrangement. This tray should be at least 14 inches below the finished grade and its contents should be built up as follows:

On the bottom a layer of stones 4 to 6 inches in diameter should be packed as closely as possible; next a generous layer of mixed gravel to fill all voids up to 1 inch above the water level. Next a 1-inch layer of screened cinders is needed to keep the soil from washing through the gravel. On the top goes a mixture of 20 percent soil, 20 percent leafmold, 20 percent sand or cinders, and 40 percent of mixed gravel to finish up the desired grade.

A little study is also of benefit in planting the garden. In order to emphasize its characteristics as a moraine, shrubs and evergreens—in fact, all taller plants—should be planted outside the slides in irregular groups. The slides and the moraine proper should be planted chiefly in low matting growth to make it comparable to an actual moraine which has been created by the flowing of a glacier down from the mountains from where it has brought the boulders and tongues of gravel. Some few evergreens of a twisted, dwarfed or stunted appearance may also be used to good advantage.

A good soil mixture for the slide should be made of leafmold, good topsoil and coarse sand or cinders in equal parts with a final top-dressing of sand and gravel. The gravel should be of mixed sizes from ¼ to 1½ inches in diameter.

Photograph by Fleda Griffith

HYBRID CATTLEYAS FROM THE FORSTER COLLECTION ON DISPLAY

Ten thousand visitors viewed the opening show of the autumn in the Main Conservatories on Sunday, November 2. About 250 orchid plants were placed in and around a South American monastery garden, which forms one of the settings in the Flower Display House this season. Chrysanthemums and other plants were shown in a cottage garden.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Exploration—Horticulture—Conservation

Comments on Three Important Works

THE office bookshelf of the editor of the Journal temporarily holds all the books that come in for review. As a result, members of the staff (and other persons) have acquired the habit of coming in frequently to inspect the new books and sometimes to read them—before they go into the library. Some volumes are in such constant demand that it is difficult to get them away from borrowers in order to have them reviewed. That is why in this number of the Journal we are publishing, not critical reviews, but explanatory comments on a trio of important volumes that have been for many months in the hands of first one person, then another. Meanwhile, their fame has been spreading by word of mouth, if not in the pages of this magazine.

CAROL H. WOODWARD.

Turkestan, Tibet, And Many Other Places

THE FIRE OX AND OTHER YEARS. Suydam Cutting. 393 pages, 3 maps, 3 pictures in color, 182 photographs, 3 indexes. Scribner's, New York, 1940. $5.

To open to any page in this tale of exploration in countries where few white men have had the privilege of traveling is to continue reading until one's eyes grow weary. Turkestan, Assam, Burma, Nepal, the Andaman Islands, Celebes, Galapagos, and finally Ethiopia—for nearly fifteen years, beginning in 1925 with the trip on which Kermit and Theodore Roosevelt found the *Ovis poli* in the Pamir Mountains of Turkestan, Suydam Cutting has journeyed in search of plants and animals in the company of such men as Captain F. Kingdon Ward, Arthur Vernay, Louis Agassiz Fuertes, Vincent Astor, Dr. Henry Svenson, Dr. James P. Chapin, and many other renowned explorers and promoters of expeditions.

Of greatest interest from one point of view is the Vernay-Cutting expedition of 1939 into the mountains of upper Burma, for Kingdon Ward was on this trip and the New York Botanical Garden was the recipient of the first complete set of more than 500 species of plants that were collected on this expedition. The forthcoming number of *Brittonia* (Vol. 4, No. 1), published by the Garden, contains an account of these plants prepared by Dr. E. D. Merrill, preceded by a report on the geography of the region and the circumstances of the trip, written by Captain Ward.

Indispensable Reference

HORTUS SECOND. A Concise Dictionary of Gardening and General Horticulture. L. H. Bailey and Ethel Zoe Bailey. 778 pages, frontispiece and 22 figures. Macmillan, New York, 1941. $12.

One has only to recall how often the question was repeated month after month in the library: "When is the new Hortus coming out?" to realize the importance of Dr. Bailey's compilation of information on plants that are known in American horticulture. The Hortus of 1930 with its 1935 supplement had become a Bible to all who acquired the habit of using it, and they were impatient, at the approach of 1940, to have the up to-date facts and names that they knew would be contained in the promised revised edition.

To those who are not yet familiar with Hortus it should be said that this "concise dictionary" contains, in alphabetical sequence, brief descriptions of 18,447 species of plants that are said to be cultivated in the United States an increase of nearly 3,000 over the names in the 1935 edition. It has, in addition, descriptions of all the botanical families to which these plants belong, illustrated articles on graftage, pruning, and propagating, directions for cultivation of important groups of plants, such as orchids, cacti, cabbages, and bulbs, and cross-references under the common names of plants.

No book of this sort could be perfect so long as research in botany continued its progress. There will always be arguments over some of the names and occasional doubt over some of the information in entries. But no book is so authoritative over so wide a field, and those who know the work of Dr. Bailey and his daughter would look far to find more capable or more conscientious workers.

Citizens' Duty

OUR NATURAL RESOURCES AND THEIR CONSERVATION. A. E. Parkins and J. R. Whitaker, editors 647 pages, photographs, tables, maps, statistical appendix, selected bibliography, and index. John Wiley & Sons, New York. Second edition, 1939. $5. College edition $4.

Twenty-three authors, including the two editors, have contributed to this work, which recognizes the increasing consciousness of the conservation problem on the part of the American citizen, and outlines the history, plans, and probable future of the movement and its effect on the life of this continent.

One reader,* who felt that to do the book justice in a review required more time than his busy life allowed, commented as follows:

"To me, the subject matter of the book is of the greatest importance. Probably because of our wealth of resources, we Americans have never realized the necessity of proper use of them. This will not be overcome until the whole subject is adequately taught in the schools. The book would seem an excellent text. It or similar work ought to be required reading in the schools and colleges, and the plain duty of the average citizen would dictate that he should familiarize himself with the material contained in the book."

The Parkins & Whitaker volume takes up soils, forests, grasslands, overflow lands, water supply, minerals, fish, wildlife, recreational resources, and the conservation of man, and concludes with a section on local, state, and national planning to avoid waste of resources.

* Mr George F. Yantis of Olympia, Wash.

Pioneer Bryologist

NOBLE FELLOW—WILLIAM STARLING SULLIVANT. Andrew D. Rodgers III. Appendix by R. T. Wareham 361 pages, illustrated, indexed. G P. Putnam's Sons, New York. $3.50

This is the biography of one of America's early scientists, written by his great-grandson. Because of the author's ability to obtain his information first hand, he gives a most accurate, instructive and interesting picture of the life of the first American bryologist.

Sullivant, of necessity, was a pioneer in the field of mosses and liverworts. Like all American scientists of his time—the early eighties—he soon found the limitations of a new land: the impossibility of finding the books he needed in his study and the difficulty of obtaining equipment. This compelled him continually to consult with fellow workers at home and abroad. Thus not only is the life of Sullivant here portrayed but one catches a glimpse of the lives of other scientists of his time—Asa Gray, John Torrey, William P. Schimper, Montagne, Schwaegrichen, Wilson, Sir William J. Hooker, and Charles Leo Lesquereux, his associate of later years.

Since Sullivant "was probably the first white child born on the west bank of the Scioto River within the present compass of the city of Columbus, Ohio," and spent most of his life near there, the author most delightfully weaves in the early history of this region, picturing its change from a wilderness to its present well-settled condition. Because of this the book has an appeal to the general reader as well as the scientist.

The appendix with its list of "Book Titles and Authors Referred to in Text"

and the list of "New Species of Mosses and Liverworts Described by William S. Sullivant and Those Described by William S. Sullivant and Leo Lesquereux" as prepared by Dr. R. T. Wareham makes the book a necessity for the library of every bryologist.

INEZ M. HARING.

Gentleman Farmer Two Centuries Ago

PLOUGHS AND POLITICKS. A Biography of Charles Read and his Notes on Agriculture. Carl Raymond Woodward. 486 pages, photographs, index, bibliography. Rutgers University Press, New Brunswick, N. J. 1941. $5.

This book owes its inception to a clever and fascinating piece of literary detective work. It is based on a well known letter allegedly written by Benjamin Franklin in 1749 wherein he refers to a farm he had purchased near Burlington, N. J. Although the letter was accepted as genuine by Franklin biographers, no one ever was able to find the farm's exact whereabouts. In the foreword to this volume Mr. Woodward relates how his efforts to locate it resulted unexpectedly in proof first: that the farm never belonged to Franklin; second: that the letter was written by Charles Read of Philadelphia, a leading industrialist owning several iron foundries and "engaged in politicks," also a farmer and an experimenter in soil and in the animal and fish husbandry of his day; and, third: that said Charles Read was a subject just waiting for a biographer.

The result of his investigation is an eminently readable, amusing and informative book. Half of it is devoted to biography and gives a good picture of the career of a wealthy gentleman "in trade" during pre-revolutionary days. The second half is devoted to his notes on every imaginable topic connected with agriculture, animal husbandry, fisheries and farm machinery; all treated with eminent common sense.

Read was an empiricist and jotted down to the last iota the behavior and cost of each experiment, both his own and his farmer neighbors. The book is a *must* for economic students of the period.

ADRIAN VAN MUFFLING.

"Plants of the Holy Scriptures" Expanded Into a Book

BIBLE PLANTS FOR AMERICAN GARDENS. Eleanor Anthony King. 203 pages, illustrated, indexed Macmillan, New York. 1941. $2.

This delightful and informative book was written by Miss King as a "follow-up" of the interest displayed by the public in the New York Botanical Garden's exhibit of Plants of the Bible, under the direction of Mr. T. H. Everett at the 1941 International Flower Show, and in the related botanical researches of Dr. H. N. Moldenke.

More than one hundred plants are accurately and attractively described as they appeared in the Holy Land of yesterday and today. For all that can be grown in this country there are simple and workable directions for their planting and care in outdoor gardens, greenhouses, pots, etc., to beautify our homes and churches. There are further suggestions as to how these plants and their products can be arranged artfully as church or table decorations, as parts of menus, as articles for a church bazaar and as fascinating materials for young people's practical projects.

The author makes the reader feel how much this luxuriant plant growth meant in the physical appearance of early Palestine and in the imagery and poetry of its peoples, and how much of it they can recapture for themselves by planting Biblical gardens.

ALMA L. ERICSON,
Evander Childs High School.

Plans for the Amateur

HOW TO LANDSCAPE YOUR GROUNDS. Loyal R. Johnson. 221 pages, illustrated with photographs and diagrams. A. T. De La Mare, New York, 1941. $2.75.

This is a handy little book which should prove of real help to the amateur confronted with the task of developing his home grounds. Particularly concise are the directions and illustrations in the chapters on Architectural Features, Walks and Drives, and on Lawns. Much of this is derived, admittedly, from Cridland's "Practical Landscape Gardening."

The subject matter is not always presented in a logical order. The pool is stocked with fish before the lawn is even

rough-graded. In the discussion and lists of plant materials, the narrow-leaved evergreens, which usually consume an appreciable part of the total expenditure for plants, might well have rated more thorough treatment.

Nevertheless, this is a good little book for the amateur landscape gardener.

P. J. VAN MELLE.

Current Literature At a Glance*

Nutrition. Soils for agricultural crops and their effect on nutrition are the subject of an article by Arnold Nicholson in *Country Gentleman* for September. Two years ago a laboratory was established by the U.S.D.A. under the direction of E. C. Auchter, Chief of the Bureau of Plant Industry, based on the idea that the minerals essential to healthy human nutrition are profoundly influenced by the soil in which the principal food crops are grown. The article tells of the results in healthier human beings in an area in Florida which was subjected to experimentation. Dr. Auchter is a member of the Board of Managers of the New York Botanical Garden.

Flower Show. Thornhill Farm, the estate of the late Joy Morton, adjoining the Morton Arboretum in Illinois, will be the scene of the Chicago Flower Show next May, the first time that this great annual show has been given outdoors. The place is described in the September number of *Garden Glories,* magazine of the Garden Club of Illinois, Inc., the organization which sponsors the show each year. Mrs. Joseph M. Cudahy, who made it possible for the club to use the estate of her father for the Chicago Flower Show, is a member of the show's executive committee and also a member of the New York Botanical Garden.

How Many Plants? An answer to the question of how many species of plants are known on the earth is given in *Science* for Sept. 5 by G. Neville Jones of the University of Illinois. He says there are approximately 195,000 angiosperms, of which 155,000 are dicotyledons and 40,000 monocotyledons; and approximately 640 species of gymnosperms. He also gives figures for the lower orders of plants.

Silvicide. Since diseased or dying elm trees are particularly susceptible to attacks by the elm bark beetle which carries the Dutch elm disease, experiments have been conducted with the chemical killing of unhealthy trees so that the beetles will avoid them. Results of several years of work are reported in Circular No. 605, issued by the U.S.D.A. last June.

House Plants. Ferns and other foliage plants, succulents, vines and small shrubs, and such long-established favorite flowering plants as fuchsias and begonias are treated in Farmers' Bulletin No. 1872 of the United States Department of Agriculture. Five cents will bring a copy from the Superintendent of Documents in Washington, D. C.

Netherlands Indies. A handsomely illustrated book entitled "Nature Protection in the Netherlands Indies" has been received from the Botanic Gardens at Buitenzorg. Among the interesting plant photographs shown are an orchid, a fungus, a thicket of tree vacciniums, and a plain of Javanese edelweiss in the Gedeh-Pangrango nature reserve; also some remarkable pitcher-plants at the Mandor reserve.

Gladioli. Several insect pests and a dozen diseases that cause trouble with gladioli are the subject of Farmers' Bulletin No. 1860 recently issued by the U.S.D.A.

Useful Forest Lands. What the Government is doing to preserve the nation's forests and to make them useful both for industry and recreation—"for jobs, permanent communities, and a stronger nation"—is told in "New Forest Frontiers," which is Miscellaneous Publication No. 414 of the U.S.D.A. Forest Service.

Land Problem. The strip of ground that lies between land cleared for cultivation and the original woods is often a problem. Leaflet 188 of the U.S.D.A. tells how to handle it to prevent woodland encroachment on the field, to im-

* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

prove drainage, to serve as a turning row for farm equipment, and to provide food and cover for birds and small animals.

Insects in Color. The Picture Sheets issued by the U.S.D.A., available from the Superintendent of Documents for 5 cents apiece, consist of colored illustrations of common pests of crop plants with their life history printed on the back. Two recent ones received at the Botanical Garden are of the harlequin bug and the tomato fruit worm.

Synthetic Coal. Corn, seaweed, grass, leaves, and wood have been used in combination to produce coal in two hours' time. The experiments of Dr. Ernst Berl of the Carnegie Institute of Technology, by which this natural product of millions of years has been produced in the laboratory, are reported in the *Science Observer* for June 3.

New Periodical. *Lawn and Garden Handbook* is the name of a new periodical for gardeners recently issued by Fawcett Publications for 50 cents. It contains more than 30 articles on planning, planting and caring for grounds, lawns, shrubs, trees, roses, rock gardens, and vines, and also considers pest control and garden structures.

Birds. Gardeners who wish to attract birds to their grounds may be interested in the bulletin on birdhouses, of which a third edition has just been issued for 20c by the Cranbrook Institute of Science, Bloomfield Hills, Mich.

Sweet Peas. Experiments to determine the mineral nutrient needs of sweet peas grown in both soil and sand have been conducted at Cornell University, and recently published as Bulletin 745 of the Agricultural Experiment Station.

Ginseng. A timely warning as to the profits *not* to be expected from the culture of American ginseng (*Panax quinquefolium*) is contained in Farmer's Bulletin No. 1184 of the U.S.D.A., entitled "Ginseng Culture."

Forestry Lessons. Boys and girls can get a good start in forestry knowledge, protection, and maintenance by studying the 50-page booklet "Forestry for 4-H Clubs," issued as Miscellaneous Publication No. 395 of the U.S.D.A.

Colchicine. Reproduction of mutations by use of colchicine in plant culture is discussed by W. E. Bott in a booklet called Plants and Chemicals, obtainable for 25c from the author at Lakewood, Ohio.

Box Trees. Eastern growers who have box trees on their property can learn about their cultural needs from Farmer's Bulletin 1855 of the U.S.D.A.

Ornamental Trees. Midwestern home owners will find useful information about the most suitable trees for their property in the recent revision of Extension Bulletin 160 published by Michigan State College at East Lansing.

Cloister Garden. A map and planting plan of the garden in the Bonnefont Cloister at The Cloisters in Fort Tryon Park has been issued by the Metropolitan Museum of Art. It contains a list of 134 different kinds of useful plants that were grown in gardens or gathered from the field in the Middle Ages. Copies of the planting plan and list are available for ten cents.

Notes, News, and Comment

Visitors. General L. H. van Oyen of Bandoeng, Java, Commander of the Air Force of the Netherlands Indies, was a guest of Mr. J. A. Schuurman, Consul General of the Netherlands in New York, in a tour of the Main Conservatories and outdoor plantings Oct. 24. Mr. Schuurman, who addressed an audience in the Museum Building during the tulip festival in the spring of 1940, is a member of the New York Botanical Garden.

Dr. and Mrs. Burton E. Livingston of Riderwood, Md., were guests of Prof. and Mrs. Sam F. Trelease of New York City in a visit to the Garden Nov. 1. Dr. Livingston was formerly plant physiologist at Johns Hopkins University and was once secretary of the A.A.A.S. During the early part of the century he worked with Dr. D. T. MacDougal in the plant physiology laboratory at the New York Botanical Garden.

Dr. W. C. Coker of the University of North Carolina spent a day at the Garden late in October working on the genus *Hydnum*. James R. Bartholomew of the Farlow Herbarium at Cambridge and George A. Hathaway of New York City

came to study diatoms; A. Axelrod, an amateur botanist from Providence, came to investigate specimens of Rhode Island plants; Mrs. W. D. Diddell of Jacksonville, Fla., has been spending several weeks on the Amaryllidaceae. Other visitors in October were Dr. F. R. Fosberg, Bureau of Plant Industry; Dr. Gladys E. Baker, Vassar College; Dr. M. A. Chrysler, Rutgers University; Dr. P. D. Strausbaugh and Dr. Leon H. Leonian, West Virginia University; Dr. A. L. Copley, University of Kansas; Marjorie Swift, Rockefeller Institute at Princeton; and Ruth Hitchman, Librarian, and Clarence E. Lewis, Instructor, from the State Institute of Applied Agriculture at Farmingdale.

Groups. Numerous clubs and classes made tours of special displays and collections at the Botanical Garden during the weeks of autumn. The garden section of the Hastings Woman's Club visited the outdoor plantings and the Main Conservatories Oct. 21. Members of the Science and Outdoor Club of Theodore Roosevelt High School visited Range 2 and heard a lecture by Joseph W. Tansey on culture of greenhouse plants in September. Students from Wadleigh High School visited the cryptogamic herbarium Oct. 8, where Dr. F. J. Seaver gave a brief lecture on algae and Mr. Joseph F. Burke on diatoms. The same day a group studied Mediterranean plants in Range 1. Two classes from the Department of Landscape Architecture at Columbia University have been making regular visits to the Garden under their instructor, Howard R. Sebold, especially to study the annuals, perennials, and waterlilies around Range 1, the wild garden and rock garden, and the adjacent plantings of shrubs. Joseph di Gemma gave a painting demonstration entitled "An Artist Paints a Landscape" before 425 members of the School Art League in the lecture hall Oct. 4.

Speakers. Mrs. Harold I. Pratt and Mr. Francis A. Powell, Jr., both of the Garden's Board of Managers, were speakers at the dinner for judges given at the Glen Cove Flower Show on Long Island Nov. 1.

N.A.G. Donald Dodds, Assistant Greenhouse Foreman at the Garden, was elected chairman, and Joseph Tansey, Greenhouse Foreman, was chosen second vice-chairman of the Greater New York City branch of the National Association of Gardeners at a meeting Oct. 8.

Gardener. Mrs. Hildegard Schneider, who has had immediate care of the rock garden for the past four years, resigned from her post as Gardener at the New York Botanical Garden the end of October to devote her time to her own garden and home. She began working nine years ago as a volunteer in Range 2; received a certificate in the Science Course for Professional Gardeners in April 1936, and was appointed a gardener the following year, after a period of outside employment.

Seminar. Dr. William J. Bonisteel spoke on "Some Aspects of Cytogenetics" and "Dichogamy and its Role in Breeding" at the nineteenth annual Plant Science Seminar of the Cranbrook Institute of Science, Bloomfield Hills, Mich., Aug. 14.

Movie. The Garden's motion picture was shown by Elizabeth C. Hall at Broadway Tabernacle Church Oct. 22; by E. J. Alexander to the Garden Club of Shrub Oak in the Members' Room Oct. 16; and by Dr. H. A. Gleason Oct. 15 to 400 Hunter College students as part of their chapel series.

Artists. The Bronx Artists' Guild is having its annual exhibition in the Museum Building at the Botanical Garden Nov. 16 to Dec. 7.

Lectures. Among lectures recently given by staff members are a talk by Elizabeth C. Hall on "The Gardener's Library" before the Grafters' Club of Towaco, N. J., Oct. 7; and one by Dr. Harold N. Moldenke to a group of Westfield clubs Oct. 14 on "Treasures of the Watchung Hills."

Gift. As a memento of her former residence in New York, a Florida woman is receiving the Journal of the New York Botanical Garden this year as a birthday gift from a friend. "When she lived in New York," the friend wrote, "the thing that gave her the greatest pleasure was visiting your gardens and shows. Although she has been away for about two years, she still talks about the things she saw in your gardens. So we are sure that she will like your Journal for her birthday." The Botanical Garden commends this idea to others who are looking for a unique and appropriate gift.

THE NEW YORK BOTANICAL GARDEN

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H. A. GLEASON, PH. D. ..... *Assistant Director and Head Curator*
HENRY DE LA MONTAGNE ..... *Assistant Director*
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FRED J. SEAVER, PH. D., SC. D. ..... *Curator*
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JOHN HENDLEY BARNHART, A. M., M. D. ..... *Bibliographer*
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W. H. CAMP, PH. D. ..... *Assistant Curator*
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JOSEPH F. BURKE ..... *Honorary Curator of the Diatomaceae*
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ETHEL ANSON S. PECKHAM ..... *Honorary Curator, Iris and Narcissus Collections*
ARTHUR J. CORBETT ..... *Superintendent of Buildings and Grounds*
A. C. PFANDER ..... *Assistant Superintendent*

To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 figures, covering algae, fungi, mosses, ferns, flowering plants. 1918. $3.50

A Text-Book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora*. $1.25.

Hardy Ferns and Their Culture. Edited by Carol H. Woodward. 40 pages, illustrated; bound in paper. 1940. 25 cents.

Plants of the Holy Scriptures by Eleanor King, illustrated, and accompanied by a list of Plants of the Bible with quotations, in the March 1941 Journal. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

An Herbal. First published by Richard Banckes in London. 1525 Edited and transcribed into modern English with an introduction by Sanford V. Larkey, M.D., and Thomas Pyles. 200 pages, including facsimile of original. Prepared by Scholars' Facsimiles and Reprints. 1941 Price to members of the Garden, $2.50; to others, $3.50.

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1941

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

MESSAGE FROM SINGAPORE

THERE was a time not so long ago when gardeners in temperate lands bowed to the seasons, and were fain to acknowledge that in winter the garden was asleep, and colourless. Then came the cult of the berried shrubs—berried treasure indeed, a crock of more than gold—and the temperate garden was transfigured.

In a tropical garden the flood tide of colour is sustained by calling on the whole tropical world to cooperate; and perhaps no region has responded more generously than has tropical South America with its wealth of resplendent trees. Later, that wonderful reserve of prehistoric plants, many of them living fossils, China, began to enrich our gardens from its inexhaustible store. Thus the culture of that ancient land which in the past has done so much to redeem Asia from barbarism put Europe and America in her debt.

In temperate lands we enjoy seasonal outbursts when the tide of colour runs strongly, as in the magic of Spring. But colour ebbs with the waning year, to flash back in Autumn for a space, then disappear in the darkness of Winter. But now with the help of berries like coloured beads, and of foliage, and where branches are bare, even of bark and bud, we need never lack the pleasant stimulus of colour And we can give as generously as we have received.

Captain Ward's expeditions have carried him for many years into remote regions of Asia, chiefly for the enrichment of gardens in temperate zones

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Cover photograph by Fleda Griffith		
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JOURNAL
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THE NEW YORK BOTANICAL GARDEN

VOL. 42 DECEMBER 1941 NO. 504

The Banckes Herbal As It Appears To The 20th Century Reader

Reprint of Rare Volume of 1525 Now Available

THE HERBAL of 1525 which the New York Botanical Garden is publishing this month in an edition of 500 copies brings to the reader of today in a volume of about 200 pages a modern transcription of the entire text and a complete facsimile of the first herbal ever printed in the English language. Members of the Garden are being given the privilege of purchasing the modern reprint of this rare old work at $2.50 a copy. To others, the price is $3.50.

The work of transcribing the original, which is known as the Banckes Herbal because it was first published by Richard [Rycharde] Banckes in London in 1525, has been done by Sanford V. Larkey, M.D., Librarian of the Welch Medical Library at Johns Hopkins University, and Thomas Pyles, Assistant Professor of English at the University of Maryland. An introduction of 18 pages by these two editors precedes the facsimile and the modern English text.

Simultaneously, an edition of 500 copies is being published by Scholars' Facsimiles and Reprints for members of this organization, which has sponsored the work of the transcription.

Only two original copies of this herbal are known in the world today—one in the Huntington Library in San Francisco and one in the British Museum in London, from which the facsimile has been taken.

The popularity of this herbal in the sixteenth century is brought out by the editors when they describe the many editions that appeared under different titles in London for several decades after 1525. They open their scholarly introduction with a few lines which reveal the style of the book:

This book, which for convenience' sake, we shall refer to as Banckes's Herbal, is a quarto volume in black letter which, according to its colophon, came from the press of Richard Banckes, a printer "dwelling in London, a little from the Stocks in the Poultry," on March 25, 1525. Its matter should be of interest to the amateur of flowers as well as to the herbalist, the botanist, the antiquarian, and the medical historian; its manner, quaint, old-fashioned, yet racy and vigorous, should guarantee it an even wider appeal.

The book's importance today is expressed by two of the greatest living authorities on the literature of herbs—Agnes Arber and Eleanour Sinclair Rohde—as follows:

It is certainly quite a different work from The Grete Herball, printed in the succeeding year, and, although there are no figures, it is in some ways a better book. Distinctly less space, in proportion, is devoted to the virtues of plants, and, on the whole, more botanical information is given. (Agnes Arber in "Herbals.")

* * *

Certainly when one reads this anonymous work known as Banckes's Herbal one is struck not only by its superiority to the later and more famous Grete Herball, but also by its greater charm. It gives the impression of being a compilation from various sources, the author having made his own selection from what pleased him most in the older English manuscript herbals. It seems to have been a labour of love, whereas the Grete Herball is merely a translation. It is almost certain that the writer made use of one of the numerous manuscript versions of Macer's Herbal, which in parts Banckes's Herbal resembles very closely. (E. S. Rohde in "The Old English Herbals.")

This "greater charm" of which Miss Rohde speaks is seen in such passages as the one devoted to one of the thistles:

Camelon

This herb is called a wolvish thistle or a wild thistle. It hath white leaves great and broad and a red flower. It groweth by the ways. The virtue of this herb is thus. If thou take this herb when the sun is in Capricorn, and the moon be new, the while thou bearest it about thee, there shall no mischief thee befall.

or the one below concerning Euphrasia:

Eufrasia

This is called euphrasy. It is good for eyes. And it hath a little ragged leaf.

That the botanical information is something not to be ignored is seen in the descriptions of comfrey, shepherd's purse, and the common dog-fennel or mayweed, an early name for which was maythe or maytheweed.

Consolida major

This is named confery. It hath leaves like to horse-heal, but they be not so white. There be two species thereof. One with a white flower, the other with a red. Its virtue is, if a man be bruised or broken within, take the roots of this herb and roast them in ashes, and let the sick eat thereof, fasting thrice, and he shall be whole. Also, it helpeth to gather broken bones. It is hot and moist. And it beareth black seed.

Bursa pastoris

This herb BURSA PASTORIS is called shepherd's-purse. This herb hath a small stalk and full of branches and ragged leaves and a white flower. The cods thereof be like a purse.

Amarisca

This herb is called dog-fennel or maythes. This herb is much like to camomile, for it hath a white flower as camomile, but it stinketh. The virtue of this herb is, it is good to drink the juice thereof for to heal the canker and the pipes of the emerods. And there be two species thereof. The one hath a white flower, and the other hath a yellow flower, and it groweth in corn.

The Botanical Garden's edition of the Banckes Herbal is being bound in green cloth with gold lettering, and covered with a jacket in two shades of green. The pages measure 6 by 9 inches. The facsimile is done by the offset process. An index provides reference to the pre-Linnaean names that are used for the herbs in the original, as well as to the common names that appear in the text, with their modern equivalents in a number of instances. Because the system of nomenclature used today for plants was not invented by Linnaeus for more than two centuries after the appearance of this herbal, many familiar plants have unfamiliar names, but others correspond closely to the names in use today—such as Altea for Althea (hollyhock or wild mallow), Coriandrum, Crocus, Allium for garlic, Cepe for onion (*Allium Cepa*), Pastinaca (parsnip), Plantago (plantain), and Quinquefolio for cinquefoil.

Clyde Fisher To Open Lecture Series Jan. 3

THE winter series of free Saturday afternoon lectures in the Museum Building will begin Jan. 3 at 3 p.m. with a motion picture in color, accompanied by kodachrome illustrations, by Dr. Clyde Fisher, recently retired Curator-in-Chief of the Hayden Planetarium of the American Museum of Natural History. He will cover territory from Maine to Arizona. The complete schedule for the winter season follows:

Jan. 3 ***A Naturalist's Rambles***
With Kodachrome and Motion Pictures in Color
Clyde Fisher

Jan. 10 ***Flower Families in the Garden***
H. W. Rickett, New York Botanical Garden

Jan. 17 ***Plants for the Home***
George Gillies, Head Gardener, Marshall Field Estate

Jan. 24 ***Working and Playing in America's Forests***
H. N. Wheeler, Forest Service, U.S.D.A.

Jan. 31 ***Color Miracles of the Winter Woods***
Rutherford Platt

Feb. 7 ***Acadia in Color***
The Beauties of Mt. Desert Island
J. H. Pierce, New York Botanical Garden

Feb. 14 ***Gardens to Live With***
Hugh Findlay, Columbia University

Feb. 21 ***Glimpses of Inca Land***
A Color Film of Peru and Chile
E. H. Fulling, Editor, Botanical Review

Feb. 28 ***Green Growing Things for the City***
Harriet K. Morse, Author and Lecturer

Mar. 7 ***Plant Collecting in Kashmir***
R. R. Stewart, Gordon College, Rawalpindi, India

Mar. 14 ***Food and Drug Plants of the American Indians***
G. L. Wittrock, New York Botanical Garden

Lotus Plants For Ornament, Food, And Medicine

By W. M. Porterfield

(No. 11 in a series of articles on Chinese Vegetable Foods in New York)

A CHINESE FRIEND of mine once told me the following legend about the lotus:

> In the west of China there is a river named "One hundred lotus flowers." It is said that during the period of the Tang Dynasty in the 7th century, a young woman finding she was not to be blessed with a child, went to a temple to implore Kwan Yin, the Goddess of Mercy, for help. Shortly afterward she dreamed that Kwan Yin was giving her a large pearl which, according to Buddhist belief, represents a living jewel. Strangely enough, a year later she gave birth to a daughter. As the girl grew up she was taught the Buddhist faith and became a very learned woman. One sunny morning when she was at her studies, an ugly ragged monk came to her house. Every member of the family shrank from him, only the girl showed him sympathy and kindness. A few days later, the monk came again carrying his dirty robe which he asked the girl to wash. She went down to the river and did so willingly. As she dipped the robe into the water a strange sensation came to her and when she wanted to lift the garment from the river she found it had turned into a large lotus blossom. The longer she held her hand in the water, the more lotus flowers appeared. She returned home to look for the monk but found he had disappeared. Henceforth the river has always been filled with lotus, which the Buddhist regards as sacred food.

This lotus is the flower upon which Buddha is pictured as sitting when in contemplative mood. Kwan Yin, the Goddess of Mercy, is also represented seated in the center of a lotus flower. So sacred is the flower considered that references to its symbolism occur throughout the literature of the ancients. And so useful is the plant that in the Rh-ya, the ancient Chinese dictionary of terms, which had its beginnings as far back as the 12th century B. C., names for all parts of the lotus plant are given. The reason for this is that in addition to the food value of the fleshy root-stock and the seeds, all parts of the plant are used for medicine. Centuries later, when the Pen-ts'ao was written, these terms were repeated and the medicinal virtues of the stem, root, leaves, flower, fruit and seed were discussed.[1]

This Chinese (or East Indian) lotus is one of the most beautiful of Asiatic flowering plants cultivated, as well as one of the most useful. The huge white and rose-colored flowers and the large rounded leaves make a striking display in water gardens where enough space is available. I have seen it blooming on West Lake at Hangchow in China and no more beautiful sight ever met the eye. In Cochin-China, the lotus is cultivated in great vases placed beside the doors of the house. The cut flowers are

[1] Stuart, G. A. Chinese Materia Medica. 278-280. 1928.

Photograph by courtesy of the
Metropolitan Museum of Art

A Chinese statuette, probably from the T'ang Dynasty (618-906) showing a bodhisattva, or disciple of Buddha, standing on a lotus-flower pedestal and holding a small lotus flower in his hand. This is one of many examples in art which show the association of this flower with Buddhism.

also used and will stand shipping if the buds are picked one or two days before opening. A striking example of the decorative value of cut lotus flowers and leaves is shown in an illustration of a bouquet[2] which was given to Queen Mary of England. This basket of flowers stood six and a half feet high and measured five feet across. The largest flower was 11½ inches in diameter. Similarly,[3] at her marriage in 1893 to the Duke of York, among the floral decorations in the royal chapel a fine bloom of white lotus constituted "the greatest rarity of the whole display."

The lotus of East India and China, as it grows in one of the outdoor pools at the New York Botanical Garden.

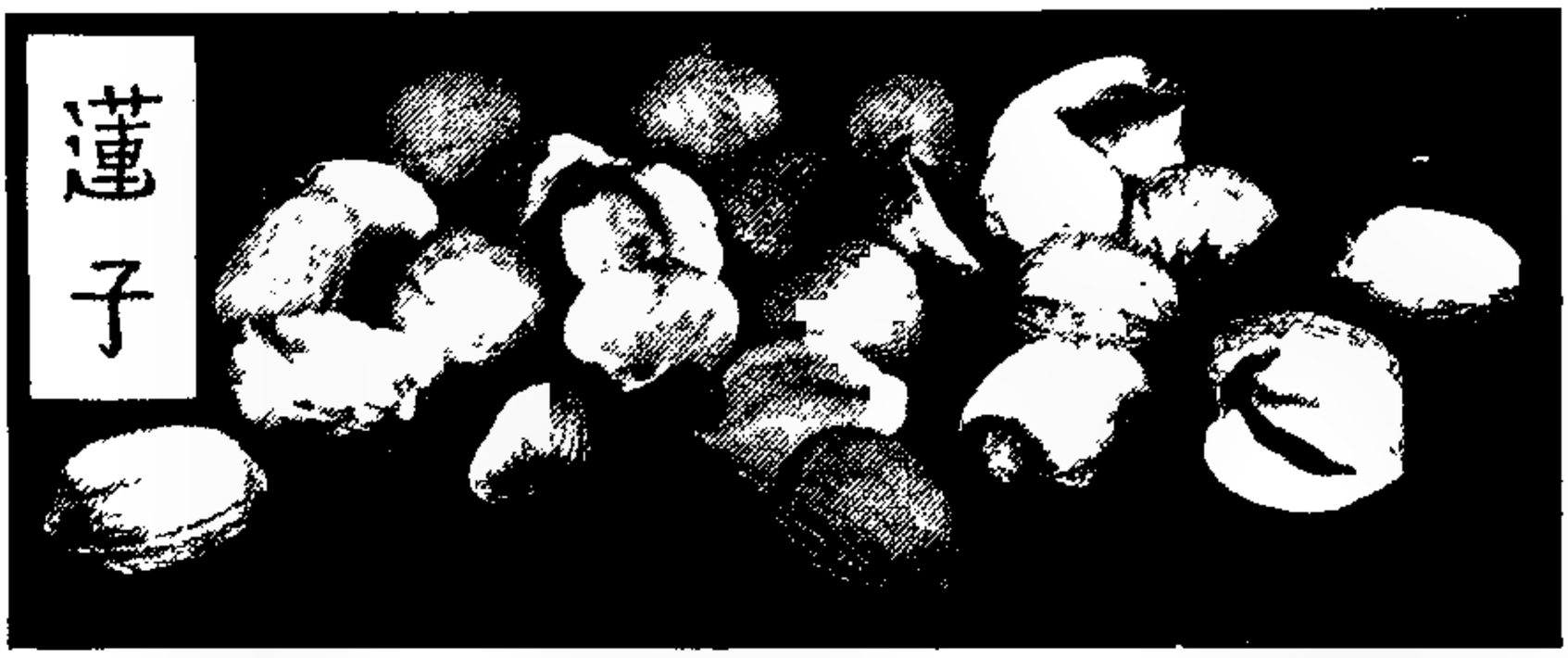
Their decorative value is attested by the fact that the flowers and leaves have found their way into Indian, Chinese and Japanese art.

Botanically known as *Nelumbium Nelumbo*, *N. speciosum* or *Nelumbo nucifera*, the Chinese lotus has been mistakenly offered many times in the horticultural trade as an Egyptian lotus, which is really a species of

[2] Gard. Chron. Ser. III, **52**:118, 119. *Fig. 52.* 1912.
[3] Gard. Chron. Ser. III, **14** 41. *Fig. 12.* 1893.

Nymphaea. Furthermore, the sacred white lotus has long been cultivated in China; it does not come originally from the Nile country. In America there is a yellow-flowered species, *Nelumbium pentapetalum* (*N. luteum*), which has been as important to the American Indian as its oriental relative has been to the Asiatics.

Because the plant is an emblem of purity in China, its different parts are given to the sick to purify the body of noxious poisons and evil



LIEN TZU *is the Chinese name for these dried lotus seeds. In two of them may be seen the dark green plumule, which must be removed before the seed is eaten because of its extreme bitterness.*

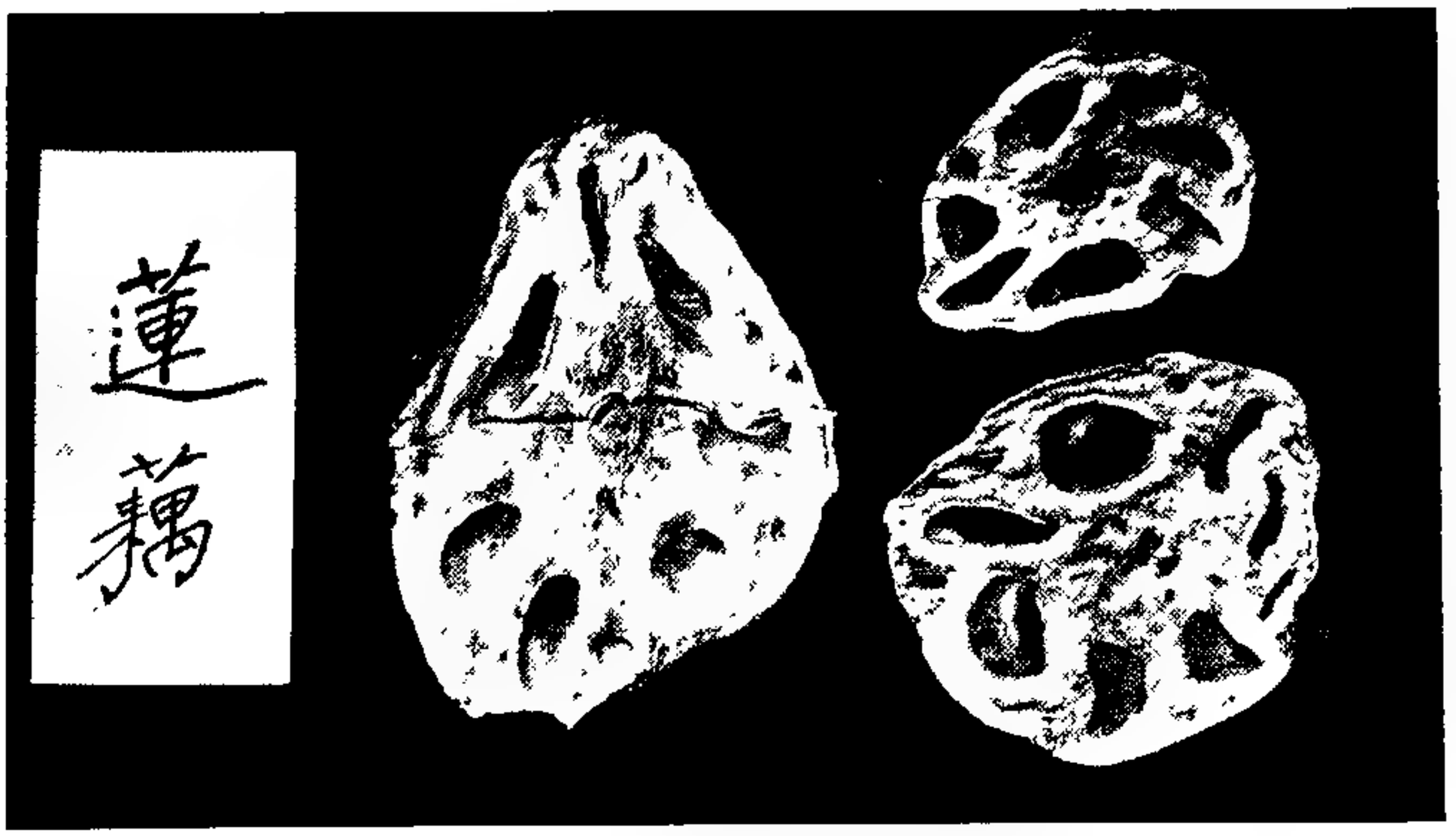
conditions. Both seeds and rootstocks are consumed in many forms for medicine and food. Stamens and petals are used in medicaments and cosmetics, and the leaves are apparently powerful remedies for a number of ailments. Dried, they are also used as wrapping paper.

The seeds,* about the size of a marble, are white after the coverings are removed. Though they are an expensive luxury reserved for the rich, on special occasions the poor man may enjoy candied lotus seeds, or BAK-PAO FAN, a kind of pudding with eight "precious" ingredients of which one is lotus seeds. Eaten raw, candied, roasted, boiled or ground into flour, they are considered nourishing and highly beneficial in preserving bodily health and strength, in promoting circulation and strengthening virility. It is said, "The more you eat, the more you want of them." But the plumule which is green must be removed from the cotyledons because it is very bitter. There is a saying in Chinese, "As bitter as the plumule of the lotus seed."

* The viability of lotus seeds is well known, and, according to one authority, compares favorably with that of seeds in the Leguminosae. In experiments with lotus seeds discovered buried deep in the soil of a certain district in South Manchuria, he says, it was shown that these seeds had been buried at least 120 years and that during that period they had retained their vitality. All the 35 seeds used by the author germinated without exception. After filing the seed coat the first signs of germination appeared in about four days. (Ohga, Ichiro. On the Longevity of Seeds of *Nelumbo nucifera.* Bot. Mag. Tokyo. **37**: 87-95. 1923.)

The sausage-like fresh rhizome of the lotus is shown above, with a cross-section revealing the fine white flesh which surrounds the air channels. Below, slices of the dried rhizome appear as they are sold in Chinese shops. The character for LIEN OU, *the Chinese name for the lotus rhizome, appears with both illustrations.*

The rootstock, which looks like links of a large sausage, is bought raw in bulk, boiled and sold in slices, or preserved in a dry state for future use or shipment to other parts. The "arrowroot" made from the fleshy rhizome is called OU-FEN, and is aromatic and sweet. It is held to be nutritious and also a good tonic, increasing the mental faculties and quieting the spirits, and is believed to be of great value in treatment of diarrhoea and dysentery. It is also given for diseases of the chest and



as an ingredient in a food prepared for infants who cannot be nursed. OU-FEN is made by crushing the root, washing the starch out with water, and allowing it to settle until the water can be poured off.

The stamens from the center of the flower are said to purify the heart, permeate the kidneys, strengthen virility, blacken hair, and make a joyful countenance. The flowers themselves are said to have a cosmetic value as well as a medicinal one. In difficult labor a woman swallows a petal upon which her husband has written, and the labor thereby is made easier.

The leaves when young float on the water but stand above the water when mature. Their size and texture when dried make them useful to grocers who wrap up foodstuffs with them. Medicinally they are reputed to be antifebrile and anti-hemorrhagic, useful to promote labor in childbirth, antidotal to poisonous fungi, and applied in the curing of skin diseases.

A chemical analysis[4] shows that the fresh rootstock contains 84.2 per cent water. The water-free residue contains 9.9 per cent protein, 5.7 per cent albuminoids, 1.1 per cent fat, 48.9 per cent starch, 2.1 per cent cane sugar, 4.8 per cent crude fiber, 4.8 per cent ash, and 14.2 per cent undetermined substances. When freshly cut the surface of the root exudes a mucilaginous gum. Their fibrous nature and failure to soften after prolonged boiling prevents these roots from being a satisfactory food from the American viewpoint.

There has been considerable research on the vitamin C content of lotus roots and lotus seeds. From feeding tests made on guinea pigs with the juice of lotus root, 10 cc. daily was found to give sufficient vitamin C to keep the animals healthy.[5] By microchemical tests confirmation of the vitamin C content was obtained not only for lotus root but for lotus seeds. [6, 7]

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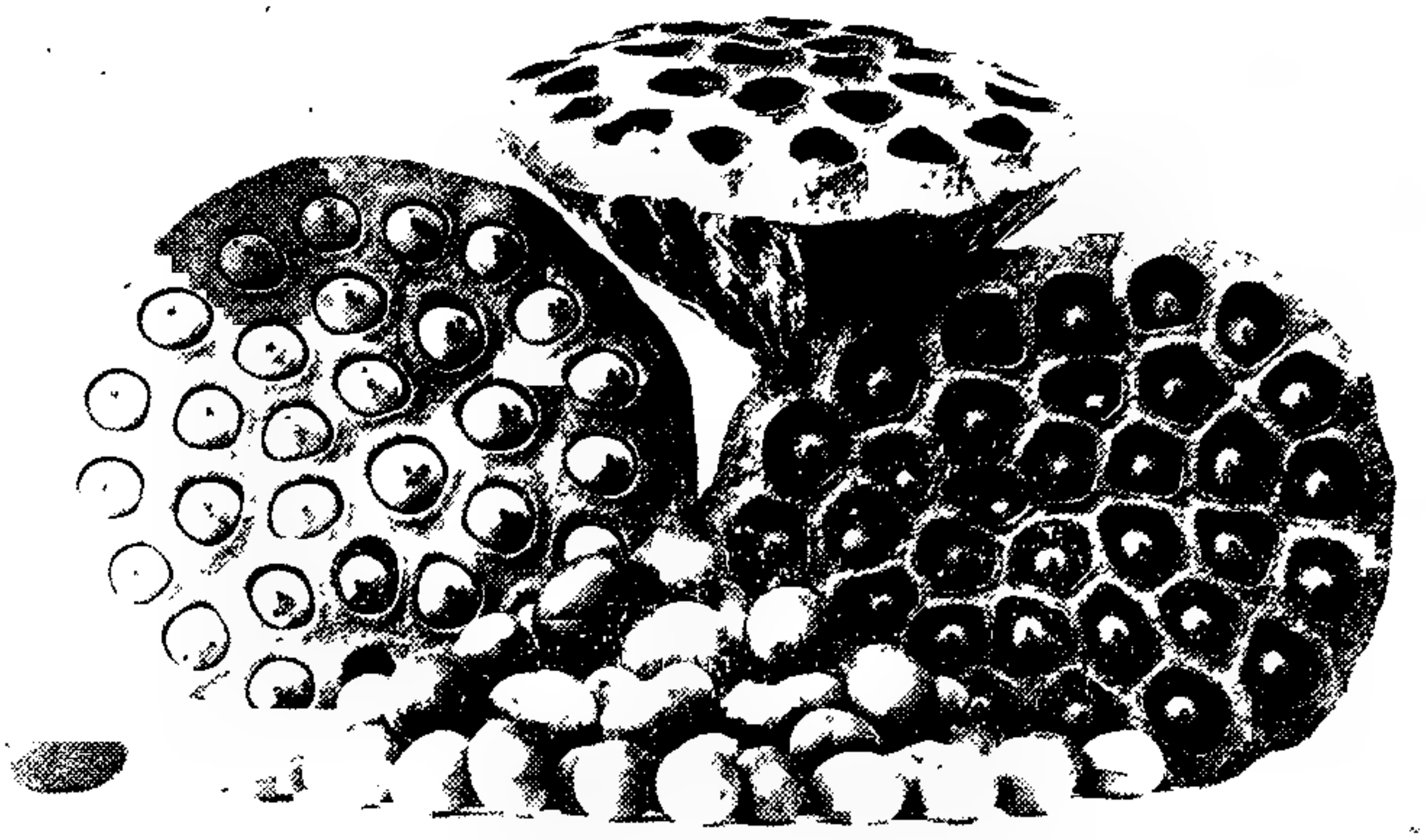
[4] Blasdale, W. C. A description of some Chinese vegetable food materials. U. S. D. A. O. E. S. Bull 68:17. 1899.

[5] Sherman, H. E. Relative water-soluble vitamin C content of nine oriental fruits and vegetables. Philipp. Jour. Sci. **38 (1)**:37. 1929.

[6] Yueh-Fong and Read, B. E. The vitamin content of Chinese foods and drugs. Chin. Jour. Physiol. **9 (1)**:55, 56. 1935.

[7] By Harris' method of using indophenol titration in mg. per grams of sample materials, lotus root contains 0.027 ascorbic acid and by iodine titration, 0.17; lotus seed, 0.29 by Harris' method and 0.51 by iodine titration. Supporting these results by microchemical tests the method of Bessey and King in titrations with 2.6 dichlorophenol-indophenol has been compared with that of ordinary iodine titration. (This was described in Chang, Y. T. and Collier, H. B. The vitamin C content of Szechwan fruits and vegetables. Chin. Jour. Physiol. **10 (3)**:439. 1936.) In February lotus root by the former method was found to contain 0.20 mg. ascorbic acid per gram of fresh lotus root, while by the latter 0.31 was found. In May it contained respectively 0.11 and 0.19, thus indicating certain physiological changes taking place as the season progresses. Finally fresh lotus seeds as compared with lotus root starch by iodine titration showed 0.3332 mg. of ascorbic acid per gram of material as over against 0.0440, while titration by the dye method gave 0.1260 and 0.0670 respectively. (These methods were given in Chu, T. J. and Read, B. E. The vitamin C content of Chinese Foods: Part II. Chin. Jour. Physiol. **15 (3)**: 251, 254. 1938.)



Seed capsules and seeds of Nelumbium Nelumbo, the Chinese, or East Indian, lotus.

Sometimes the lotus seed has been called the "sacred bean." These are the "beans" that Pythagoras forebade his disciples to eat. Their symbolical relation to fertility arises from their manner of propagation. When mature the large capsule or head of seeds will often break off and fall on the water, where it will float until it lodges in some quiet spot. By this time the seeds have germinated and the head has become a nursery of young plants which eventually separate and fix their roots wherever circumstances permit.

One of the earliest reports of the lotus from China was that by the Jesuit missionary, Martini (1655) who spoke of roots and seeds as food in Kiangsi province. Fortune in 1844 and again in 1855, referred to the beautiful lotuses in the lake on the island of Poo-to (near Ningpo) in front of the Buddhist temples. He also reported its cultivation as a profitable crop in terraces along both sides of the Canton River near Whampoa.

In the early European attempts to cultivate the lotus, one experience by the head of the royal gardens at Monza, Italy,[8] showed that seeds planted in February, March or April in a greenhouse aquarium produced poor plants, while seeds planted in water in May out in the open air grew into vigorous healthy plants. Active cultivation of the lotus for its roots and seeds is undertaken in China and Japan on a large scale by planting in terraced paddies in the same manner that rice is cultivated. When in bloom these fields present a beautiful picture.

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[8] Scalarandis, A. Culture des Nelumbium en plein air. Rév. Hort. **72**:242-244. *Figs. 114—116.* 1900.

Ornamental Deciduous Shrubs

A Brief Review Of Hardy and Useful Kinds Recommended for Use Within a Radius Of Sixty Miles of New York City

By P. J. van Melle

The material presented below has been adapted from part of the series of lectures on "The Cultivation of Trees and Shrubs" in the TWO-YEAR COURSE IN PRACTICAL GARDENING *given at the New York Botanical Garden in the autumn of 1940. It will be continued in later numbers of the Journal.*

THIS EVALUATION of deciduous shrubs is presented mainly to assist the beginner within the region of New York to select, from among the kinds most often found in nurseries and catalogs, those that are best suited for his own various needs, situations and soils. It is not intended as advanced instruction or as an exhaustive treatment of the subject, but it has been limited in the main to good species and a few varieties that are known to be stocked by nearby nurseries. The few less common, deserving things that have been added are suggested without prejudice to other good types of shrubs that may be offered from time to time by commercial growers. In fact, the home gardener will be wise if at every season he visits well stocked nurseries and keeps an open mind toward new and unfamiliar plants of tested local merit.

No attempt has been made to include in this list many named horticultural varieties and hybrids like those of lilac and mock orange. For these one had better consult catalogs.

The tallest-growing plants in the present list border closely upon a category of still larger materials containing such things as magnolias, flowering dogwoods, and Japanese maples. No precise line can be drawn between that and the present category.

The heights obtained in cultivation by the larger and intermediate kinds here listed will vary considerably, depending upon soils, moisture, and other factors. The variation has been indicated in many instances, and the stated heights represent, generally, less than maximum development of each kind in its native haunt. They should be understood as approximate, not as precise statements.

Within the region being considered here—60 miles in any direction from New York—the milder part is that nearest the coast, particularly New Jersey, while the colder portions are those that lie inland.

The terms "open situation" and "in the open" are employed here to indicate exposure to the sun. It should be noted that autumn color and other foliage tints will be brought out best in such places.

This list is not intended to be a general treatise on shrubs; rather it is a guide to the kinds available to the public, with notes on how they can best be used within the area indicated. The materials have been arranged on the basis of their botanical families. An alphabetical index will be provided at the end.

SWEET GALE FAMILY

Myrica pensylvanica (*M. caroliniensis*). An aromatic shrub to 6 ft. or more, native of our coastal region, thriving in poor, light soils and useful mainly in naturalistic plantings, especially near the shore, but forming neat, clumpy shrubs for more domestic uses as well. Deep, dull-green, oblong to lance-shaped leaves, remaining till late autumn. Clusters of small, round, grayish berries close to the old wood. It may serve as a transition material between broad-leaved evergreen and deciduous shrubs.

M. cerifera. Wax-Myrtle. A large shrub or small tree with narrower leaves than the above. Native farther south, less hardy here. Semi-evergreen in sheltered situations.

Comptonia asplenifolia. Sweet-Fern. A pretty, native roadside shrub to 4 ft. or more, with delightfully aromatic foliage, but of no floral value; spreading by means of long woody rootstocks into large patches in the sterile, even clayish soils of roadsides or in poorish light woodlands. The hard-wooded branches are somewhat suggestive of beech twigs. An attractive and desirable shrub, but difficult to transplant and available only from dealers in native plants. Best results may be expected from collected stock which has been cut back, top and root, and planted out somewhere before it is placed permanently. Not suitable for use as individual specimens, but only for spreading patches.

BUTTERCUP FAMILY

Paeonia suffruticosa.—Tree-Peony, but more properly shrubby peony. The species from which, through hybridization, mainly with *P. lutea*, have been derived the numerous many-colored hybrids which are now receiving attention after many years of neglect. They have little value as border shrubs, so are best used in the manner of herbaceous peonies. Long-lived plants, they should be left undisturbed, once they become established.

BARBERRY FAMILY

BERBERIS. Barberry. An important genus of thorny shrubs, mostly sharply spiny, planted for their pleasing habit, often for their attractive autumn coloring, also for their decorative flowers and fruits. Most of the lower kinds have a diffused effect. Not exacting as to soil.

NOTE: Barberries hybridize freely, and some of the handsomest of seedlings may at times be found in nurseries, often combining the attractions of several kinds, such as the long drooping fruit clusters of *B. vulgaris* and the pinkish fruit-color of *B. Wilsonae*. Semi-evergreen hybrids may also be found between the evergreen and deciduous barberries.

B. Thunbergii. Japanese B. Most commonly used as a hedge plant and often in shaded, difficult places where few other shrubs would live; too little appreciated as a specimen and border shrub. A broad, massive plant, to 5 ft. or more in height and often of greater width, with handsome autumn color and red fruit, attractive to birds, remaining into winter.

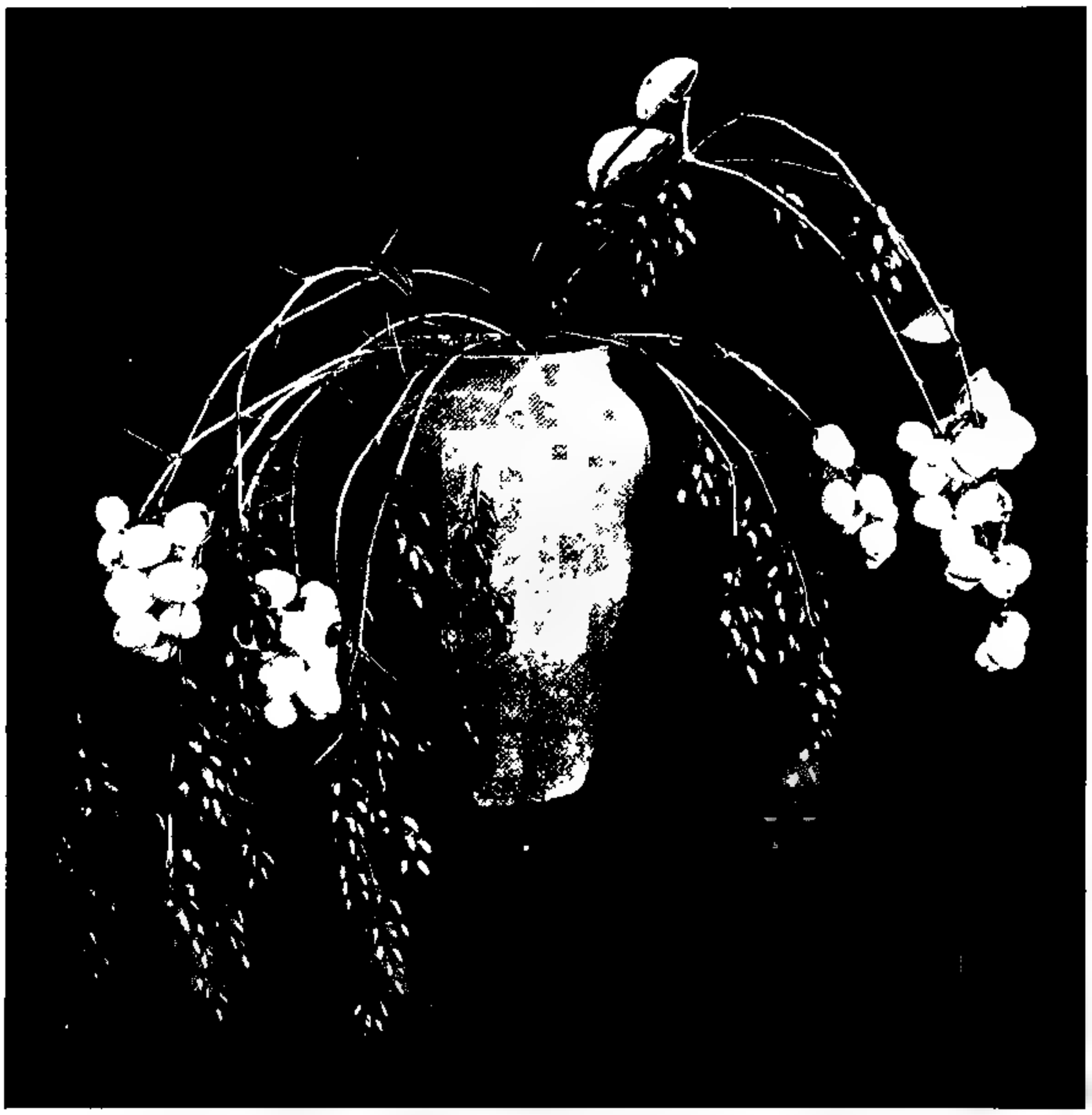
B. vulgaris. Common B. An old-world species, naturalized in the U. S. An erect shrub, to 9 ft., typically with dull-green leaves, but most attractive in the bronze-tinted seedlings of the var. *atropurpurea*, in which the yellow flowers and ripening fruit, passing from orange to red, are most happily contrasted. These tinted seedlings rank among the most charming of all border shrubs. *B. vulgaris* may be used quite freely, except where wheat is grown nearby, since it harbors a wheat rust disease.

B. koreana. Korean B. An erect shrub to about 7 ft., only mildly thorny and remarkable for brilliant red autumn color and scarlet berries. One of the most decorative of the taller kinds.

B. dictyophylla, from China, to 6 ft. high or less, presents the unusual effect of whitish branches and a white lower surface to the leaves. These enhance the show of the autumn coloring of the leaves and the ultimately red, late-ripen-

ing fruits. The white stems are even more marked in the var. *albicaulis*. An occasional single plant of this kind suffices in the smaller landscape.

B. Wilsonae is a low spreading Chinese species, bearing salmon-pink fruit in drooping clusters. Not reliably hardy in the colder parts of our region.



One of the barberry hybrids is shown here in a jar with the snowberry, Symphoricarpos albus.

B. Vernae, from China, is a loose, diffused, graceful, rather transparent shrub with drooping clusters of red fruit; of great decorative value.

CALYCANTHUS FAMILY

Calycanthus floridus. Carolina Allspice or Sweet-Shrub (Strawberry Shrub to Grandmother). A bold, large, and heavy-leaved shrub, native from Virginia southward; prized mainly for its odd, chocolate-colored aromatic flowers in early summer. Moderately useful in the shrub border in open or shaded situations and not too dry soil. Under this name one may at times obtain *C. fertilis*, a related species with flowers that are not aromatic.

LAUREL FAMILY

Lindera Benzoin (*Benzoin aestivale*). Spice-Bush. Native shrub, to 12 ft., useful mainly for naturalistic woodland plantings. Conspicuous in early spring with tiny clusters of minute yellow flowers on the bare wood. Small, scarlet berries in late summer, and yellow autumn leaves.

Whitish branches and white undersides to the leaves are the features of Berberis dictyophylla, a Chinese shrub which also has attractive autumn foliage and late red berries.

SAXIFRAGE FAMILY

PHILADELPHUS. Mock-Orange or Syringa. Except for the so-called Lemoine hybrids, which are derivatives of *P. microphyllus,* the cultivated mock-oranges have no other merit than that of their fragrant ivory-white flowers, borne in June. The *coronarius* kinds have coarse, uninteresting foliage and are without attractive habit or form. They are therefore best used in the background of borders. They endure shade.

Most valuable are the Lemoine hybrids; mostly low shrubs to about 4 ft. with rather attractive narrow leaves. Numerous named kinds are available, such as **Bouquet Blanc, Manteau d'Hermine, Mt. Blanc.** A popular hybrid much planted in late years is one called **Virginal.** It has charming, semi-double, fragrant flowers, produced somewhat continuously in summer, but is perhaps the least attractive and boniest of all the group as to foliage and habit.

P. coronarius, of Caucasian origin, grows to 9 ft. or taller. Its so-called var. *grandiflora* represents a different species which has larger, scentless flowers; it should be avoided. Var. *aureus* is a compact, golden-leaved shrub to 5 ft. or less, too conspicuous for anything but occasional use as an accent.

DEUTZIA. Of these, too, the larger kinds have little other value than that of their small white scentless flowers, borne in small clusters, mostly in June. They are unattractive as to foliage and habit, and serve best, if they must at all serve, in the background of borders.

D. scabra, an oriental species, has provided most of the common garden forms. There are single and double-flowered, white and rose-tinted varieties. These taller kinds endure shade well, and grow 10 ft. high or more.

D. gracilis, D. rosea, D. Sieboldiana and ***D. purpurascens,*** all lower, generally earlier-flowering kinds, are more valuable.

These are mostly not over 4 ft. high in cultivation, and make rounded shrubs, useful for the foreground of borders.

HYDRANGEA. A genus of coarse but showy and often highly ornamental flowering shrubs, native to eastern Asia and North America. They will thrive in any reasonable soil, but do not like dry situations.

H. paniculata, originally from Japan, is rarely grown in its typical form with loose, pyramidal, erect clusters at the ends of the summer's growths; more familiar is the var. *grandiflora,* known as the Peegee Hydrangea, which bears round bulging clusters of white to rose-tinted flowers. It is a coarse shrub with no other value than that of the flowers in late summer and autumn.

H. arborescens, a native shrub, is represented in gardens by its variety *grandiflora,* called **Hills-of-Snow.** In July it bears large round clusters of white flowers at the ends of the current season's growth. It is usually cut to the ground each spring, and then forms a round, dome-shaped bush in summer, to 4 ft. or more in height. A coarse, but not unattractive shrub. Best used in the open.

H. macrophylla (*H. opuloides*), from Japan, is the species from which are derived numerous horticultural forms, some with pink or blue flower clusters. These are produced at the ends of the growths of the preceding year. They are not hardy about New York City, but are hardy down along the New Jersey coast, where they are a prominent feature in the suburban landscape. Farther north, they are often grown as tub plants, or planted out in summer, but taken up in the fall and planted out again in spring. The terminal buds, from which the flower clusters develop, should not be permitted to suffer frost injury. The plants flower in May or early June, and should be pruned back when finished blooming, so that new growth may develop during the summer for next year's flowering. Best in open situations.

H. quercifolia, Oak-leaved H., and ***H. radiata*** are native American shrubs planted for the effect of their large, decorative leaves, which take on purplish autumn colors, more than for their flowers. Both are bold, conspicuous shrubs not easily placed in the average small border. They endure shade pretty well.

Light overhead shade is enjoyed by Fothergilla major, one of our native American shrubs which flowers in early spring.

WITCH HAZEL FAMILY

Fothergilla major. Dwarf-Alder. A hardy, erect, pyramidal shrub, with broad foliage suggestive of alder, turning orange-yellow in autumn, and grown chiefly for its showy, short broad spikes of petalless white flowers appearing with the young foliage in May. It thrives in a moist, sandy or peaty soil and deserves much wider use than it enjoys now. Native of Georgia.

Corylopsis pauciflora, from Asia, is the hardiest species in this genus. A choice, broad shrub to 8 ft. high or much less in this region, bearing pretty, yellow, bracted, drooping flower spikes before the leaves appear. North of New York City, best used in sheltered, dampish situations in the foreground of the shrub border.

HAMAMELIS. Witch Hazel. The chief attraction of these plants, which thrive in sandy, acid woodland soil, is their unseasonal flowers, borne upon the bare branches. They endure the shade of light overhead foliage.

H. vernalis, a native of the South, but hardy here, grows to 6 ft. high, flowering in late winter or early spring. The shrub spreads from suckering roots.

H. mollis, Chinese W., while often growing into a small tree farther south, usually remains low and shrubby well north of New York City. It is the choicest kind, with roundish, soft-hairy leaves, grayish woolly underneath, and bearing golden-yellow flowers, reddish at their base, in late winter or early spring.

ROSE FAMILY

Stephanandra incisa, from Japan and Korea, though not entirely hardy above New York City, and likely to have the tips of the branches and some entire branches winter-killed, is even there one of the most valuable and attractive of all foliage shrubs. Its deeply incised, often bronze-green foliage, turning reddish-bronze in autumn, furnishes an ideal diffused effect, such as one likes to rely upon in landscape compositions. The small clusters of insignificant white flowers have little decorative value. The shrub grows to 6 ft. high or less.

S. Tanakae is much like the preceding, with foliage turning orange-scarlet in autumn.

Neillia sinensis. This Chinese shrub approaches *Stephanandra* in foliage effect and degree of hardiness. In June, it bears small pinkish flower clusters which are of slight decorative value. It makes a more transparent shrub than *Stephanandra,* 4 to 6 ft. high.

PHYSOCARPUS. Ninebark. These large-leaved, shade-enduring shrubs are too coarse to merit use in the average border.

P. opulifolius (*Spiraea opulifolia*), a native species, commonly offered by nurserymen, grows to about 10 ft. high and has broad leaves to 3 inches long and whitish flower clusters in May to early June. Its variety *aureus* or *luteus* is still more objectionable because of its conspicuous yellow leaves.

P. monogynus, from the Middle West, about 3 ft. high, may serve occasionally for the border foreground, though it lacks distinction and beauty.

Neviusia alabamensis. Snow Wreath. Somewhat suggestive of *Physocarpus* in foliage effect, but less coarse, and with an attractive show of small, fuzzy, white flower clusters along the stems in late May or early June. A truly attractive border shrub to 6 ft. high, of diffused habit, for sun or light shade, not quite reliably hardy in the colder parts of our region, but worth planting even if occasionally injured. It may be pruned after flowering time.

SPIRAEA. For our purposes we recognize here three groups.

GROUP I: Those with white flowers in clusters along the growths of the preceding year, flowering in spring or early June. They should be cut back hard after the flowering season.

S. VanHouttei, to 7 ft. high, an excellent, popular shrub of diffused foliage effect, with snow-white flowers about June 1.

S. ***trichocarpa*** from Korea and **S. *cantoniensis*** (*S. Reevesiana*), from China and Japan are of similar habit and foliage effect, the latter being the least hardy of the three.

Spiraea prunifolia makes an attractive border shrub when it flowers in May.

*S. **prunifolia plena,*** Bridal Wreath, is a slender, thin shrub to 6 ft. or more, with very pretty, wreath-like flowering sprays in May and handsome foliage tints in the autumn.

*S. **Thunbergii*** from Japan is a low, loosely spreading, small-leaved, transparent shrub to 3 ft., flowering in April or May and occasionally breaking into bloom during mild, late-autumn weather. Its hybrid, *S. **arguta,*** is merely a larger version of it.

GROUP II: Those with flattish clusters of white or rose-colored flowers appearing in June or later, or somewhat continuously through the summer. These are mostly low, round-topped shrubs.

*S. **japonica*** (*S. callosa*) derivatives belong here; typically to 4 ft. high, with pale- or deep-rose flowers. There is a var. *alba*, with white flowers; and a hybrid, ***S. Bumalda,*** to 2 ft. high, in shades of rosy pink.

Further hybrids include **Anthony Waterer,** with cerise-red flowers; and **Froebeli,** a somewhat taller version of **Anthony Waterer,** to 3 ft. high, flowering continuously from June on.

GROUP III: Those with flowers arranged like cat-tails, terminating the branches.

*S. **Douglasii,*** a western U. S. native, and *S. **Billiardii,*** one of its hybrids, are erect shrubs to about 6 ft. high, with lilac-rose flowers. They sucker from the roots and are the least refined type for use in the average small border.

SORBARIA. Large, loose, suckering shrubs, of decorative appearance, with pinnate leaves, attractive in large, naturalistic landscapes and thriving well in moist soils, as along water courses. Mostly unsuitable for use in small borders, as they grow from 6 to 9 feet high. They thrive in sun or shade and may be used in woodland plantings. The best species are, in the order of their flowering:

*S. **sorbifolia,*** June; *S. **assurgens,*** July; *S. **Aitchinsonii,*** July to August. These produce large, showy, terminal, plumelike clusters of white flowers which become rather unsightly when finished and are best removed.

EXOCHORDA. Pearl-Bush. Hardy, pretty, May- or June-flowered shrubs of

rather erect, graceful and slender habit, bearing terminal panicles of pure white flowers.

E. Giraldii var. ***Wilsonii,*** from China, is probably the best of all; to 8 ft. or more, with flowers to 2 in. wide.

COTONEASTER. One of the most important groups of ornamental shrubs, containing plants of widely varied habit and uses; some of them low, spreading, semi-evergreen kinds, valued mainly for their glossy foliage; others grown chiefly for their decorative, mostly red fruit, and some for their autumn coloring. All of them prefer a light, sandy, well-drained loam; and their best foliage tints are developed in open sunny places. Some, especially the more heavy-wooded kinds, are subject to fireblight, which should be cut out when discovered. We review only some of the more important, representative species, all Asiatics. Black-fruited kinds are omitted as they are not as showy as the red.

C. ***horizontalis.*** A semi-evergreen, small- and glossy-leaved, wide-spreading plant mostly not over 3 ft. high, with branches and leaves arranged into flat sprays, along which red fruit is thickly sprinkled toward autumn. Best used where it may develop its full width or be trained up a wall; too often crowded into places where it must be continually kept pruned. Its var. *perpusilla*, smaller-leaved, is not better than the type. This species may suffer winter injury north of New York City in severe winters, but not sufficiently serious to forego its use.

C. ***adpressa,*** with handsome autumn coloring and larger red berries, makes a very low dome-shaped specimen plant, useful for occasional accents. Its beauty is wasted when it is massed. Deciduous or semi evergreen.

C. ***apiculata,*** red-fruited and deciduous, is a less formal plant, suitable for a low ground-cover, less than 15 inches high.

C. ***microphylla,*** which is evergreen, with small, glossy leaves, is not hardy in the open in the colder part of our region. It is of informal, spreading habit; red-fruited. Its variety *thymaefolia* is still smaller-leaved; bronze-tinted from late summer on.

C. ***divaricata,*** to 6 ft. high, of broad spreading habit, is distinguished among the larger kinds by its flat sprays of branchlets, somewhat suggestive of the branching manner of *C. horizontalis.*

C. ***rosea*** is one of the best; to 9 ft., with light rose flowers. *C.* ***salicifolia*** var. ***floccosa*** grows to 15 ft. *C.* ***racemiflora*** and several varieties of it, to 7 ft. or more, have rather showy flower clusters suggestive of *Spiraea*, followed by large red fruits.

C. ***Dielsiana,*** a loose, transparent shrub to 6 ft. or less, adaptable for woodland planting, and used sometimes as a cover shrub for pheasants.

C. ***Zabeli*** var. ***mineata*** is showiest of all in fruit, with conspicuous, clustered orange-red fruit. It makes a flat-topped, spreading shrub less than 6 ft. high with somewhat grayish-green leaves. No autumn coloring in the foliage.

C. ***Franchetii*** var. ***cinerascens*** is a low, gray-leaved kind with orangy-red fruit, not entirely hardy north of New York City; usually not over 3½ ft. high.

ARONIA. Chokeberry. Suitable for moist soils and shaded, woodland conditions—most effective in naturalistic plantings.

A. ***arbutifolia*** var. ***brilliantissima*** is of outstanding merit. Upward of 6 ft. high, with handsome, brilliant red clustered berries persisting through the winter.

Photinia villosa, from China and Japan, is a large informal shrub to 10 ft. high, with dark-green foliage turning more or less brilliant red in autumn in open situations. Red fruit ripening in August, persisting into winter and not eaten by birds. Useful for large naturalistic plantings, thriving best in light, well-drained soil in full sun.

Chaenomeles lagenaria. Japanese Quince. An old favorite, to 6 ft. or more in height, with dark, glossy-green foliage persisting till late fall; handsome red flowers, formed like large apple blossoms, produced on the old wood. Sometimes used effectively as a clipped hedge. Numerous named varieties and hybrids, in shades of pink, salmon and red or white are grown in nurseries. These are among the loveliest of early spring flowering shrubs.

C. japonica (*Cydonia Maulei*) is a much lower equivalent of the above, to about 3 ft. high, and of spreading habit. Var. ***alpina*** is still lower, dwarf and suckering, and a very useful low ground-cover or foreground shrublet.

Kerria japonica, in its typical, single-flowered form, is a graceful, loose, airy shrub to 6 ft. high, with bright-green twigs, along which are borne charming yellow flowers suggestive of wild roses in May. The foliage is light, bright-green It is particularly useful because of its suitability for shaded and woodland conditions. It sometimes suffers slight winter injury above New York City. There is a more robust and taller double-flowered variety which lacks the charm of the single.

Rhodotypos kerrioides, Jetbead, resembles *Kerria* somewhat in foliage effect, grows to about 5 ft. high, and bears charming single white flowers in May, followed by hard, shiny, jet-black fruit, persisting in winter. Suitable for shady conditions. From Japan and China.

Potentilla fruticosa. Shrubby Cinquefoil. Our native form of this widely distributed species is a low, rather erect shrub to 3 ft. high with pinnate, somewhat silky leaves and bright-yellow flowers in early and mid-summer. It thrives in a diversity of soils, from boggy to quite dry, and in sunny situations. It serves occasionally for naturalistic effects on rather poor dry soils, but is hardly of sufficient quality for use in the average shrub border. Several varieties of it, of superior appearance, including some white-flowered ones, are offered. Not all of these are hardy about New York City. Var. *dahurica,* from Siberia, and var. *Veitchii,* both white-flowered, may be found hardy.

Snow-white flowers appear in little rounded clusters on Spiraea Van Houttei in early June.

ROSA. Without going into garden hybrids the following species are among those suitable for use as decorative shrubs.

R. rugosa, the Hedge Rose,* is an old-fashioned shrub with densely set spines and broad, bright-green leaflets; typically rose-flowered. There are several varieties, white and rose, single and double-flowered, as useful as the type for informal hedges.

R. eglanteria, the Sweet Briar, and its numerous named hybrids are all very charming shrubby roses, mostly upward of 6 ft. high, with single flowers in various shades produced in elegant arching sprays. Desirable for use in the shrub border, and finely fragrant.

R. Hugonis from China, is a graceful, charming shrub with bright-green foliage and small leaflets. It bears lovely single yellow flowers in great abundance on its long, arching sprays, in May or early June. Its drooping branches may well be employed as drapes over garden walls. This is one of the prettiest of all; attractive enough in leaf, apart from the flower display, which is of short duration.

R. Ecae, an Asiatic species, is another charming rose, to 6 ft. high, with pale-yellow to white flowers.

R. rubrifolia, from Europe, has purplish-tinted, though not obtrusive foliage, useful as a contrast in the shrub border. Red-flowered, to 6 ft.

PRUNUS. Of the many species of this fruit-producing genus, two are mentioned here are being particularly worthy as small flowering shrubs.

P. triloba. Flowering Plum. Of this pretty Chinese species only the double-flowered form is commonly planted; mostly budded on short stems. It forms a small shrub which, in the spring, becomes a living bouquet of soft-pink, double flowers set thickly along the stems. The little standard trees make good accent plants in flower gardens. The foliage is unimpressive and of little value in compositions.

P. glandulosa. Flowering Almond. Of these attractive little Japanese shrubs only the double-flowered forms are usually planted. They come in shades of pink and red and in white. They are budded close to the ground and make small shrubs of upright habit, to about 4 ft. high; like the preceding, thickly set with showy blossoms in the spring. They serve well in the foreground of the border, in sunny situations, but have little other value than that of their flowers.

(To be continued)

* Called Ramanas Rose in some of the earlier garden books and catalogs.

New Courses Beginning Next Month

First Sunday Morning Tours Also Scheduled for January

TWO courses of study that have not heretofore been taught at the Garden will begin in January: Flower Arrangement and Vegetable Gardening.

Max Schling, who for forty years has been one of the leading florists in New York, will conduct the six sessions in ***Flower Arrangement*** to be given on Monday afternoons at 2:30 beginning Jan. 12. Tea will be served by the Garden at the close of each session. The lectures and demonstrations will include the use of flowers for table decorations, exhibitions, vase arrangements, and personal use, with instruction on color combinations and the proper care of cut flowers. The fee is $15.

John Watts, who will be teaching part of the Three-day Course in Practical Gardening for the second time next spring, will also conduct the class in ***Vegetable Gardening,*** which will meet for an hour's lecture on Monday evenings at 7:45 beginning Jan. 19. The culture of each different vegetable crop for the home grower will be discussed in detail, and the instruction will also cover the choice of site for a vegetable garden, the layout, soil preparation, fertilizing, use of hotbeds and coldframes, selection of vegetable varieties, care of the garden, how and when and what to plant for a succession of yield, and the harvesting and storing of crops. There will be 12 sessions for a fee of $10.

Two-year Courses Continued

The winter term in the Two-year Course in Practical Gardening will begin on Thursday evening, Jan. 8, with the first of 12 lectures on ***Outdoor Flower***

Gardening to be given by P. J. McKenna. This term of study is a prerequisite for the spring term in Outdoor Gardening Practice. New students will be accepted for registration in the winter term without having been enrolled for the previous class. The fee is $10.

In the Two-year Science Course for Professional Gardeners, the first term's work in Systematic Botany will be continued with a term of ***Systematic Botany Laboratory,*** under Dr. H. N. Moldenke, to begin on Monday evening, Jan. 5. Dr. H. W. Rickett will continue the work in ***General Botany*** which was begun by Dr. W. H. Camp in the fall. These two subjects were formerly designated Plant Morphology, taught by Dr. Rickett, and Plant Physiology, by Dr. Camp. This year, the two subjects were combined into General Botany I and II, the first term being devoted to general morphology and physiology of the vegetative parts of the plant, and the second to these phases of plant growth and reproduction. New students may enroll for the winter term in General Botany, which will consist of 12 weekly lectures beginning Jan. 5 at 8:50 p. m. The tuition is $5.

Latin American Plant Studies

Also beginning in January will be a series of four conducted tours of the Main Conservatories on Sunday mornings for the purpose of gaining greater familiarity with the plants of Latin America. Howard Swift, who inaugurated the Garden's first conducted tours last winter, will have charge of these. Registration must be made by Dec. 30. The trips will take place on Jan. 4, Jan. 18, Feb. 1, and Feb. 15, from 10:30 a.m. to 12:30, with a fee of $1 being charged for the series.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Making Green Things Grow In An Urban Atmosphere

YOUR GARDEN IN THE CITY. Natalie Gomez. 247 pages, illustrated, indexed. Oxford University Press, 1941. $3.

The problems and pleasures of gardening under city conditions are ably discussed in this very practical book. The author's vocation has developed from her avocation—making green things grow in an urban atmosphere. She tells us that city gardening is not country gardening. It is vastly more difficult. Yet the country gardener may learn much from this enlightening book. For most plants which endure the rigors of city life should flourish in the clean freedom of the country.

Miss Gomez has foreseen the pitfalls which are likely to be encountered by the city dweller and has handled the many phases of her subject with thoroughness. There are chapters on design, construction, soils, garden care and related subjects. The second half of the work treats of the actual plants which are most tolerant of city conditions—trees, shrubs, herbaceous perennials, annuals—even vegetables.

The city gardener will save himself expense and worry when he learns (for instance) that the honey locust and the ginkgo are among the most tolerant trees for the back yard, and that hemlocks would not do nearly as well for him as would the Japanese yews. Certain willows and Russian olives are reasonably content in big tubs on a breezy penthouse roof.

In attractive format, this book is illustrated with many "before and after" photographs, showing that, despite our sombre housefronts, thriving gardens may, and do, exist in the city.

H. K. Morse.

Impractical Aspects of Botany

PLANTS AND MAN. Clarence J. Hylander and Oran B. Stanley. 518 pages, illustrated and indexed. The Blakiston Co., Philadelphia, 1941. $3.

Among the many possible approaches to botany as a subject for college students, the relations of plants to human culture have recently been emphasized and here find new advocates and a new textbook. The idea is attractive. Types of vegetation and plant resources have played their parts in history and in the shaping of civilizations. Such relationships might well serve as the basis of a "general" course as valuable and certainly as interesting as the more formal and experimental aspects of the science.

With such a promising program it is the more regrettable that this book must be judged technically incompetent. Part I, entitled *The Nature of the Plant World*, surveys the morphology, physiology, and evolution of plants—a textbook of botany in brief. A few samples will support the verdict just given. On p. 10 a thallus is defined as a "plant characterized by only a few different tissues co-ordinated in a primitive fashion." On p. 13, "Plants need air and must breathe." On p. 34, the first plants to develop vascular tissues were "ferns and their relatives the horsetails and clubmosses." On p. 64, "Seeds are always the product of sexual reproduction, and therefore develop from fertilized eggs, ." On p. 67, the pollen tube of a pine "eats its way through the tissues of the female prothallus." On p. 86, plants are classified in a curious jumble of "phyla," the algae split into three, while one includes all seed-bearing plants but excludes the ferns. On p. 130, "Glucose can be synthesized *only* by plants." On p. 107, the "flower" of *Amorphophallus* is "five to six feet in diameter." Errors in spelling and in grammar are plentiful.

The remaining five parts are chiefly a catalogue of "plants as foods and beverages," "plants as sources of wood and fibers," and so on. Even if these parts are substantially accurate, their usefulness in a general text may be questioned. But enough has been said to make it clear that no thoughtful teacher could use this work as a text. On p. 157 the mature carrot is mislabeled with a cortex, and on p. 306 dogwoods have a "one-seeded, commonly red, fleshy berry." A few definitions from the glossary catch the eye. Sepals are "the green parts of the flower whose function is to support and protect the corolla." The species is "the smallest classification unit." A haustorium is "a finger-like projection from a fungous filament into a host cell for purposes of absorbing food" (but figure 255 illustrates a haustorium of dodder).

It is a thankless task to enumerate another's errors, and an unwelcome experience to discover that a book should not have been published. It would be better in every way if publishers would secure such criticisms before the work is accepted for publication.

H. W. RICKETT.

Ten Excellent Monographs

ADVANCES IN ENZYMOLOGY. Vol. I. Edited by F. F. Nord and C. H Werkman 433 pages. Interscience Publishers, Inc., New York, 1941. $5.50.

This book is a collection of ten independent monographs, each one written by an outstanding contributor to the subject. Nine of them are of interest to the plant physiologist. Some of the subjects covered are: protein structure, virus activity, specificity of proteinases, phosphate and energy, chemical nature of catalase, and photosynthesis. T. Franck and H. Gaffron covered the entire field of photosynthesis without their usual mathematics. C. B. Van Niel wrote the monograph on bacterial photosynthesis, a subject to which he has contributed much.

It is to be hoped that the editors continue the good work they have started and that they can maintain their quality.

F. W. KAVANAGH.

Notes, News, and Comment

Advisory Council. Mrs. William A. Lockwood was appointed Second Vice-chairman of the Advisory Council of the New York Botanical Garden Oct. 20, to succeed Mrs. Carl A. de Gersdorff, who died last April. Resolutions of appreciation for the character and services of Mrs. de Gersdorff, also of Mrs. Gilbert H. Montague, who died Sept. 23, were read at the meeting. Mrs. Montague had

been a member of the Advisory Council since March 10, 1938. She lived in New York and in Seal Harbor, Me.

Five new members were elected to the Advisory Council by the Board of Managers of the Garden at a meeting Nov. 18. They are Miss Mabel Choate of New York and Stockbridge, who had previously been a member but had resigned a few years ago; Mrs. William Redmond Cross of New York and Bernardsville, N. J.; Mrs. John Ross Delafield of New York City; Mrs. Alfred G. Kay of Chester, N. J., and Mrs. Walter Douglas of Phoenix, Ariz., Chauncey, N. Y., and Mexico City.

After the meeting of the Advisory Council Nov. 10 in the Members' Room, the group visited the laboratory of Dr. William J. Robbins, where he addressed them on "Vitamins and Plant Growth."

Students. Botany classes from Connecticut Women's College, under the direction of Dr. George S. Avery, visited the laboratories of Drs. Robbins, Stout, and Dodge, the herbaria and fossil plant collections in the Museum Building, the library, and the greenhouses during a trip to the Botanical Garden Nov. 13. Sixty students from the general botany class at New Rochelle College went through the Main Conservatories Nov. 15 Throughout the month, plant materials classes from Columbia University continued to study the collections of conifers at the Garden.

Chrysanthemum. Upon her return in November from a four months' trip to Alaska, Mrs. Jerome W. Coombs was honored by Michigan State College, the horticultural department of which named a new chrysanthemum of her choosing the Sarah V. Coombs chrysanthemum. The flower is of the decorative type, of a rich deep pink shading to crimson at the center. It was originated by Prof. R. E. Wildon of Michigan.

Library. Files of horticultural magazines, also periodicals on geography, travel, and kindred subjects, which are frequently used by visitors to the library at the Garden, have been placed on the shelves in the rotunda, where they will be at hand for convenient reference. Also in the rotunda are books for leisurely reading, rather than reference, so that the casual visitor may more readily find material that will be of interest. Juvenile literature on such subjects as botany, forestry, gardening, and nature study, has also been moved to the rotunda, in response to the increasing demand for books of this type from young people who come in after school and on week-ends and holidays.

Sir Arthur William Hill. The Director of the Royal Botanic Gardens at Kew, England, Sir Arthur William Hill, was killed by a fall from his horse while he was riding in Surrey on Nov. 3. He had been Director there for nearly 20 years. Sir Arthur contributed the editorial on the inside cover page of the New York Botanical Garden's Journal last June.

John Bergen. A former apprentice gardener at the New York Botanical Garden, John Bergen, was accidentally killed at camp near Watertown, N. Y., in October. He left his work at the Garden last February to enlist in the National Guard.

Mrs. Christian R. Holmes. A member of the Corporation of the New York Botanical Garden since Jan. 8, 1934, Mrs. Christian R. Holmes died Sept. 29. Her home was in New York City.

James Speyer. The New York Botanical Garden lost one of its early members of the Corporation in the death of James Speyer on Oct. 28. He had been associated with the Garden continuously since January 1905.

Gardeners Forum. Joseph W. Tansey was named Chairman of the Gardeners Forum at the New York Botanical Garden at the October meeting. P. J. McKenna, former chairman, was elected Vice-chairman and Theodore Olack, Secretary-Treasurer. The group meets monthly to present papers on horticultural subjects.

Radio. Adventures in Science, the weekly radio program of Science Service, had Dr. William J. Robbins as guest speaker Oct. 23. Interviewed on the subject of fundamental scientific research, Dr. Robbins spoke on behalf of the National Science Fund, of which he is Chairman.

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Until 1944: E. C. AUCHTER, MARSHALL FIELD, MRS. ELON HUNTINGTON HOOKER, JOHN L. MERRILL (*Vice-president*), COL. ROBERT H. MONTGOMERY, H. HOBART PORTER, and A. PERCY SAUNDERS.

II. EX-OFFICIO MANAGERS

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ROBERT MOSES, *Park Commissioner.*
JAMES MARSHALL, *President of the Board of Education.*

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R. A. HARPER, SAM F. TRELEASE, MARCUS M. RHOADES, and MARSTON T. BOGERT, *appointed by Columbia University.*

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HENRY DE LA MONTAGNE ..... *Assistant Director*
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FRED J. SEAVER, PH. D., SC. D. ..... *Curator*
BERNARD O. DODGE, PH. D. ..... *Plant Pathologist*
JOHN HENDLEY BARNHART, A. M., M. D. ..... *Bibliographer*
H. W. RICKETT, PH. D. ..... *Assistant Bibliographer*
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ROBERT S. WILLIAMS ..... *Research Associate in Bryology*
E. J. ALEXANDER ..... *Assistant Curator and Curator of the Local Herbarium*
W. H. CAMP, PH. D. ..... *Assistant Curator*
CLYDE CHANDLER, PH.D. ..... *Technical Assistant*
ROSALIE WEIKERT ..... *Technical Assistant*
FREDERICK KAVANAGH, M.A. ..... *Technical Assistant*
JOHN H. PIERCE, M.A. ..... *Technical Assistant*
CAROL H. WOODWARD, A. B. ..... *Editorial Assistant*
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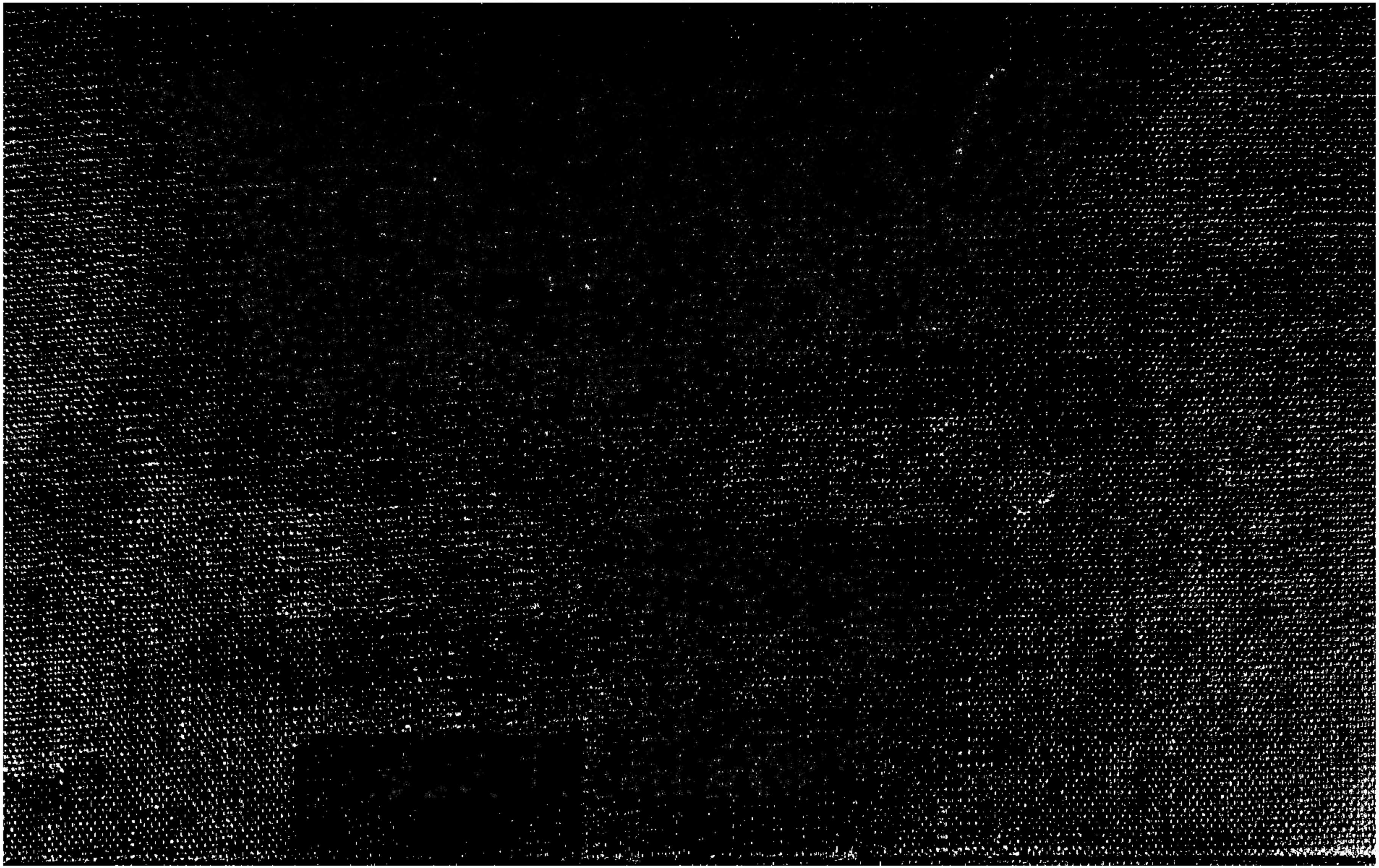
JOSEPH F. BURKE ..... *Honorary Curator of the Diatomaceae*
B. A. KRUKOFF ..... *Honorary Curator of Economic Botany*
ETHEL ANSON S. PECKHAM ..... *Honorary Curator, Iris and Narcissus Collections*
ARTHUR J. CORBETT ..... *Superintendent of Buildings and Grounds*
A. C. PFANDER ..... *Assistant Superintendent*

To reach the Botanical Garden, take the Eighth Avenue Subway to Bedford Park Blvd., the Third Avenue Elevated to the Bronx Park station, or the New York Central to the Botanical Garden station; or drive up the Grand Concourse then east on Mosholu Pkwy., or, coming from Westchester, turn west at the end of Bronx River Pkwy.

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Robert H. Fife, Chairman; Mrs. Elon Huntington Hooker, First Vice-chairman; Mrs. William A. Lockwood, Second Vice-chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

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